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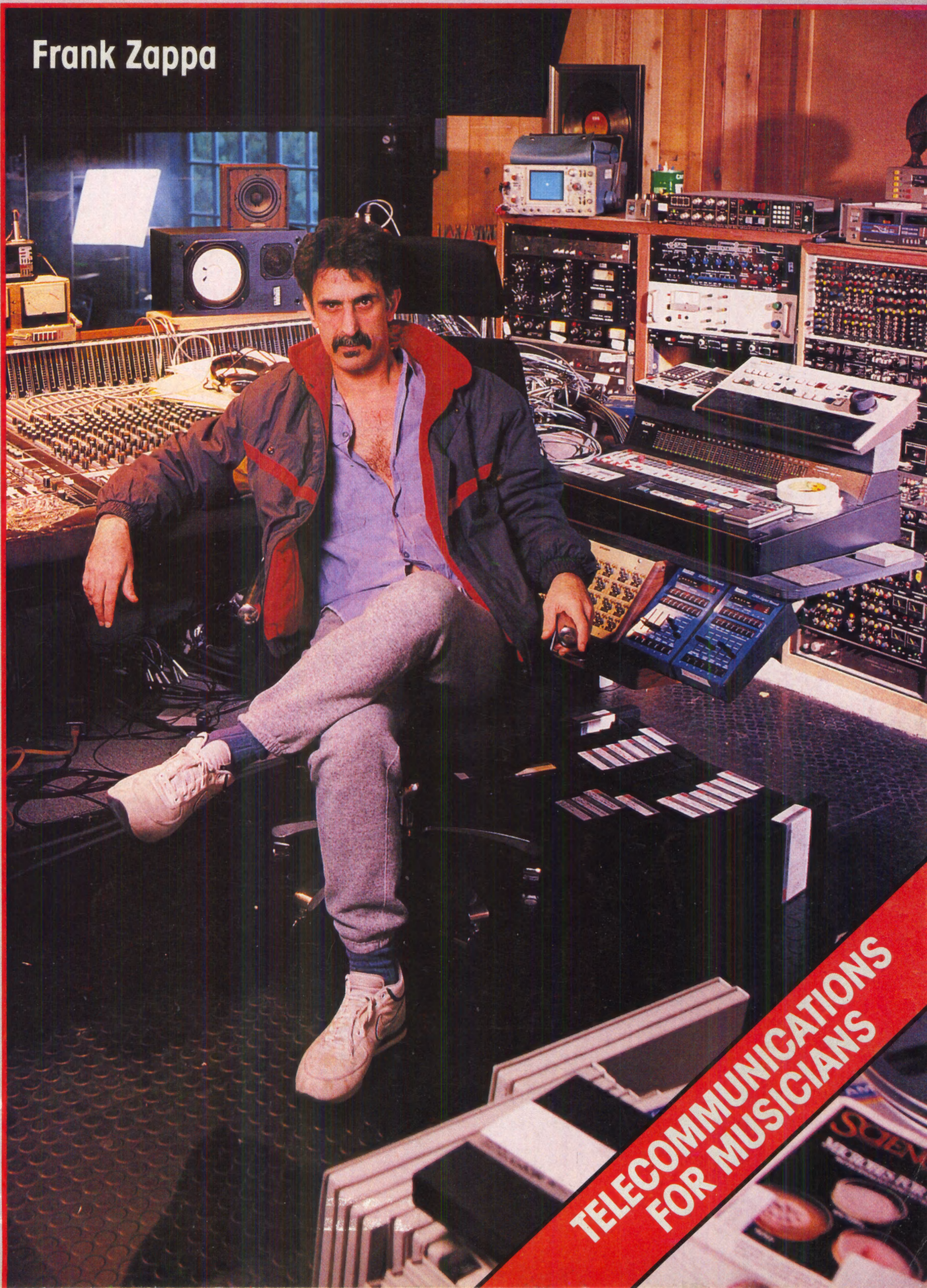
Frank Zappa

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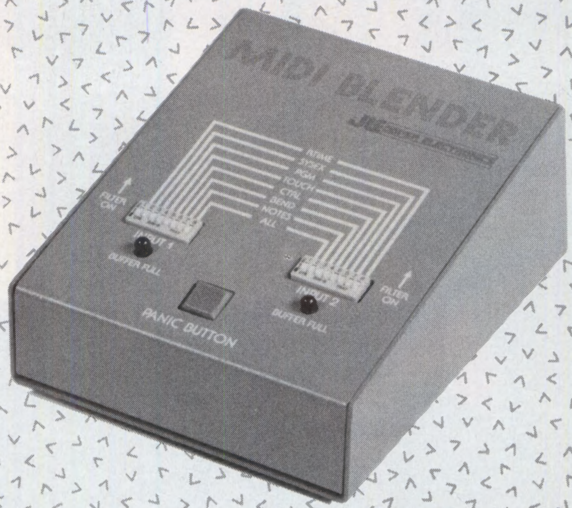

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VOL. 2, NO. 9 SEPTEMBER 1986

Electronic MUSICIAN

A MIX PUBLICATION

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COVER

Frank Zappa, back from fighting the forces of evil in Washington, D.C. by championing truth, justice and the First Amendment, stretches out in his home studio ready for some fun with The Digital Consort (his Synclavier). Photo by Ladi Von Jansky.

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Editor's Note

You've seen the ads: "16 fabulous patches for the CZ-101!" "64 scintillating sounds for the DX7!" "New sounds for your Matrix-6!" "Buy our Emulator II/Prophet 2000/Mirage samples!"

Let's put aside the question of whether these patches and samples are, in fact, as wonderful as claimed. Clearly, sound is a very personal thing, and I doubt that a lounge act is going to get excited by the same sounds that turn on punkers. The question that concerns me is that if more and more musicians forsake programming, how will those musicians express their individuality with synthesizers and samplers?

With an instrument whose sound can't be changed, the differentiating factor between musicians lies in compositional style and "touch." Certainly millions of people have played pianos very expressively and in highly personalized styles, even though all pianos have the same basic sound signature. Yet synthesizers were supposed to add an additional dimension to expressiveness by offering complete control over timbre, not just notes. Samplers in particular offer the promise of using the entire world as a sound source, although many musicians seem content to use their samplers simply to copy the "sounds du jour."

I suppose this is understandable. As Howard Jones said in his interview in the March **EM**, he considers himself primarily a songwriter and not so much a programmer. Why not, he reasoned, let those who are expert in programming produce sounds, and those who are more interested in songwriting use those sounds? And of course, producing high-quality samples is not easy—there's no way I'm going to be able to sample a string section, so if I want a string section, it makes sense to use a factory disk.

So I don't feel that using canned sounds is bad per se . . . not at all. But I do have a few recommendations.

First, *modify* those canned sounds to create something personal. At the very least, alter the envelope times to fit the rhythmic "pocket" of your music—then progress to creating versions of a sound that are the perfect timbral complement to your music.

Second, if you're new to synthesis, *analyze* those canned sounds and try to learn what makes them "tick." This can teach you a lot about how sounds are synthesized, which will come in handy when you try to create your own sounds.

Third, for every canned sound you use, *invent* one of your own. It may not be as wonderful as the patch put together by the "expert" programmers, but keep at it . . . the more you practice, the better you'll get. Pretty soon, *you* will be the expert, and your music will be all the richer for your expertise.

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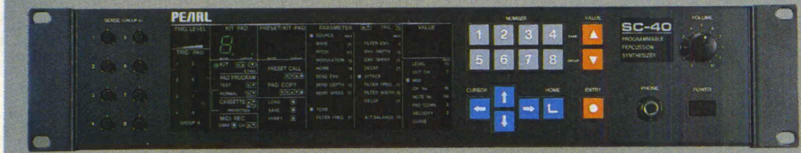

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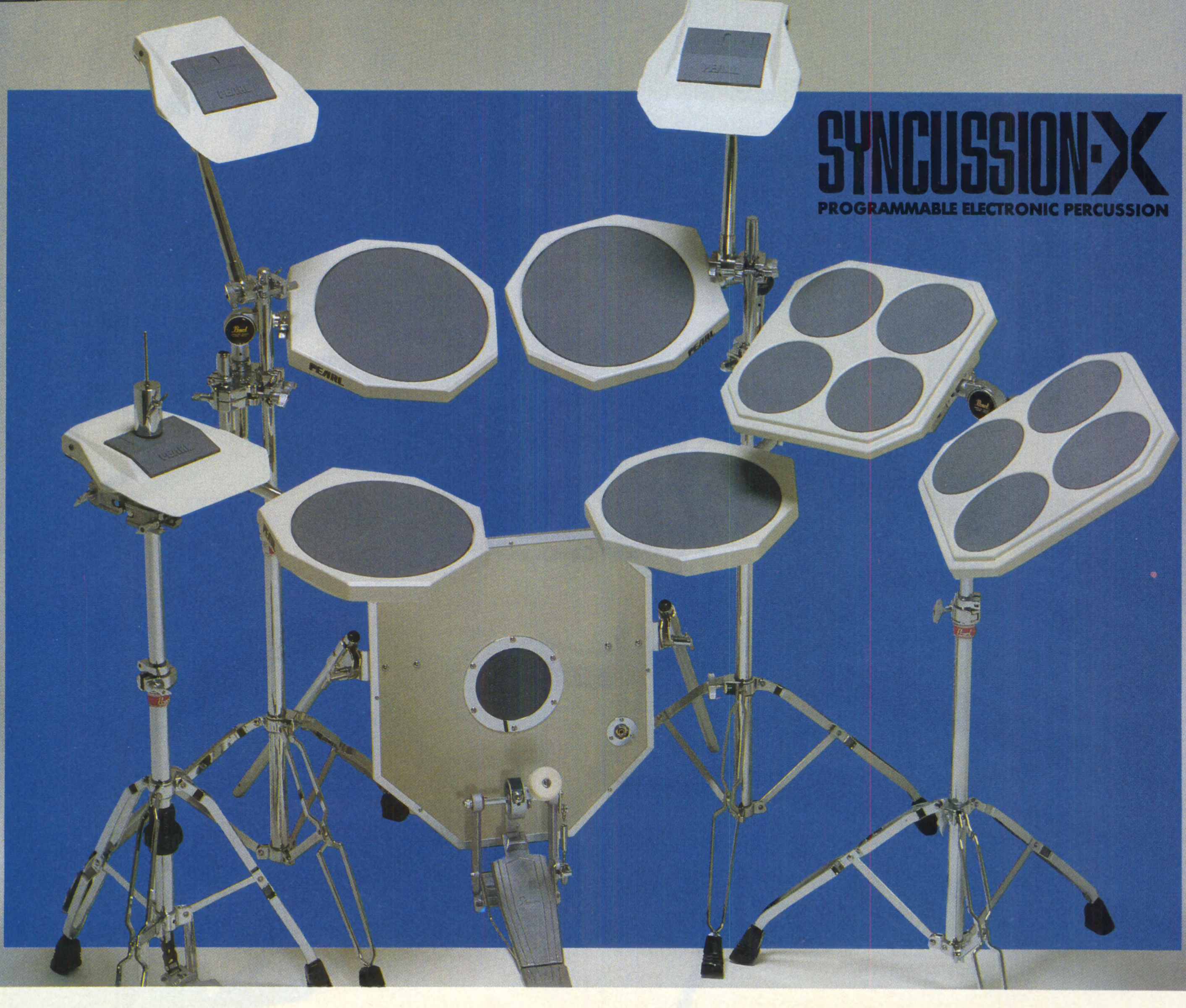

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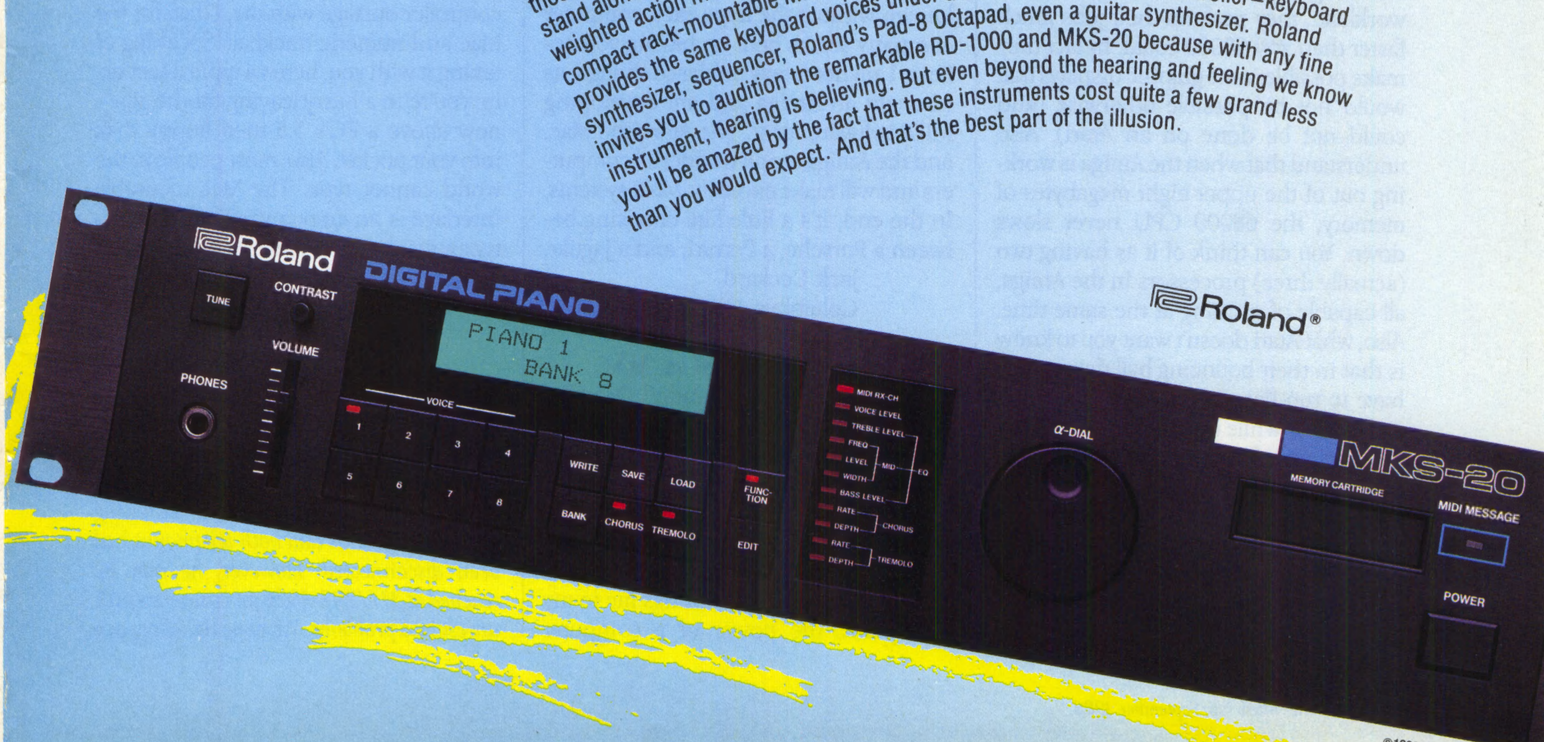
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In Praise of Randomness

In response to Henry Schneider's article in the June '86 issue ("Have You Tried This?"), I must say that I have tried random patch generation techniques and, believe it or not, they really work! Being thrown into an unusual sound is extremely helpful when it comes to breaking out of a creative "rut." I wrote a BASIC program for random patch generation for my Roland Juno 6; although data entry was tedious, the results were rewarding. If anyone would like a copy of my Juno 6 program, please enclose a self-addressed stamped envelope and I will send a copy.

Since I now own a DX7 and Amiga, I would like to work on a random patch generator using system exclusive messages. If anyone else out there is interested in writing such a program for the Amiga, I would be more than happy to work with them on such a project.

Mark D. Braunstein
5471 Braddock Ridge Drive
Centreville, VA 22020-1645

Core Wars, Part 1: Atari vs. Amiga

I was upset to see some of the inaccurate information about the Amiga show up in **EM**'s June '86 article on the Atari 520ST. Please let me correct your readers on some important points on the Amiga and the ST.

First is the point about the Amiga's processor "hanging around" 90 percent of the time while the peripheral chips do the work. The only time the Amiga's custom chips take over the machine's bus is when they are doing very complex graphics and animation. When they do relieve the Amiga's 68000 CPU of some of its workload, they perform their jobs much faster than any 68000 could. In fact they make possible some graphic displays that would not be possible otherwise (and could not be done on an Atari). Also understand that when the Amiga is working out of the upper eight megabytes of memory, the 68000 CPU never slows down. You can think of it as having two (actually three) processors in the Amiga, all capable of running at the same time. Also, what Atari doesn't want you to know is that in their bouncing ball demo, they have to run flat out tying up everything just to do it, while the Amiga is just using six percent of its processor's available time. You could run several other programs at the same time on the Amiga.

Second is the assumption that the Atari's DMA port makes for very fast disk transfers. In an unbiased comparison of the Mac, Atari, and Amiga in the May '86 issue of *Byte*, the Atari was last in two of three Disk I/O benchmarks. In the sequential access test (the most likely form of disk I/O in MIDI sequencers) the Atari was 8.8 times slower than the Mac, and 3.1 times slower than the Amiga.

Third is the fact that the first major computer company to have MIDI built in was Yamaha on the CX5M. (Malcolm Cecil did not say in the article that the Atari 520ST was first with MIDI, but that it was included for the first time by a major personal computer manufacturer. At least for this year, Yamaha is not really in the same league computer-wise as IBM, Commodore, Apple, etc.—Ed.). I could really care less whether MIDI is built in or not, just as long as a MIDI interface is easily available.

Fourth, while this is mostly personal opinion, I've heard the internal sound chip on the Atari and didn't think it was good for anything more than a game of Space Invaders.

I would also like to make a statement about what I think is a very important point concerning qualifications for a good MIDI computer. One of the things I hate is first having to load company A's voice librarian, then having to reset the computer to load company B's sequencer, and later having to reset the computer again to go back and run company A's librarian again. Copy protection makes this even more aggravating. However, the Amiga's multi-tasking operating system and the Mac's switcher program make loading programs a one time occurrence.

Finally, don't get the impression that I am anti-Atari. The Atari is a very nice computer. I simply want the facts to be known without the hype each computer company seems bent on having you believe. I am not totally unbiased though, as I bought an Amiga and am developing MIDI software for it. The Atari, the Mac, and the Amiga are all wonderful computers and will make excellent MIDI systems. In the end, it's a little like choosing between a Porsche, a Ferrari, and a Jaguar.

Jack Deckard
Columbus, OH

Core Wars, Part 2: IBM vs. MAC

I think Freff's "DOS Diatribe" (May '86 **EM**) unjustly cut down the Mac as a high-end machine. As a user of the IBM PC, Mac, and Apple IIe, most of my computing is done on the Mac because of its intuitive user interface. However, I use the IBM running Sequencer Plus to do all of my recording, which brings me to my first point: the power of a computer comes from well-written software, not hardware. Some IIe programs process words as well as an IBM, conversely there are IBM programs that are nearly useless—it all comes down to the software. In the current state of the computer industry, if a task can be done on one machine it can probably be done on others as well. The tradeoffs are expense, speed, and ease of use. However, there are some things you can do on a Mac with only software that you can't do on an IBM without adding peripheral cards.

My recommendation is for the Mac, especially if you've never worked with a computer other than an "automatic bank teller" or synth. The bottom line is, determine what your specific computing needs are at present, then what needs or wishes you may have for the future, then do some research before making your decision.

Steven J. Parish
Hartford, CT

Core Wars, Part 3: Of Mice and Men

I have a few comments in response to Freff's "DOS Diatribe." The dreaded mouse on my Mac has been in use for four or five months, and I have three cats who do their best to clog it with hair. I've had to open it twice. The $8 mouse pad isn't such a bad idea, though I don't have one; if you have a terminal fear of mice, you can get Wico's $69 "Turbo" trackball, an excellent substitute. I'm planning to get the Wico Turbo Numeric trackball, which comes with cursor keys and a numeric adding-machine-type keypad—I have to do business junk with my computer too. If I had to take a CRT and controller onstage with me, I'd go for the Mac and numeric trackball. Speaking of taking it with you, here's a typical scenario: you're in a hurry leaving for the gig—now shove a PC's 5.5-inch floppy disk into your pocket. Also, most people in the world cannot type. The Mac mousable interface is no more a straitjacket than a typewriter keyboard interface, and neither one is God-given.

Craig O'Donnell
Chicago, IL

Caveat Emptor

Several readers have complained to us about slow or non-existent service from PGS Electronics. We contacted Greg Schneck, head of PGS, who said that they were in fact having financial problems and both telephones had been disconnected. However, he may be reached at 317/297-4926 for customers with unresolved problems. We hope that Greg can *soon give the kind of service he used to give, but meanwhile, we suggest readers who order from PGS do so on a C.O.D. basis.*

Error Log: In the **EM** MIDI Interface article (May 1986), power supply connections for the 7405 are assumed, as is often the case with schematics. Make sure that pin 14 connects to Vcc and pin 7 connects to ground. In the future, we will avoid "assumptions" like this for the sake of those who are new to D.I.Y. electronics. Thanks to reader Tom Towle for pointing this out.

*OK y'all, remember to pull out your back issues and **write in the Error Log corrections.** You don't want to go to build the circuit one day, only to have forgotten this addendum published four months later.* EM

Suggestion Box

Here's your chance to make suggestions to the industry. Send your complaints, compliments, and ideas to: Suggestion Box, Electronic Musician, *2608 Ninth St., Berkeley, CA 94710. We also welcome suggestions from manufacturers to users of individual pieces of equipment.*

IBM PC proposals: I'm a PC owner and all of my expansion slots are full, so I cannot use "standard" MIDI interfaces, such as the Roland MPU-401, that require a slot in the PC. However, most available software supports the MPU-401 only, which has become a de facto standard. One solution is to write software in a hardware-independent manner and adapt to a particular hardware configuration by the use of specialized software modules called *device drivers,* which are supported very nicely under current versions of PC/MS-DOS. Under this scheme, the user of a software package using the standard software interface chooses the device driver for the particular MIDI interface being used. If the interface is purchased, the supplier provides the device driver. The user who prefers, as I do, to "roll my own" writes a custom device driver. This scheme is used extensively in PC graphics, where there is a need to adapt software to a plethora of available graphics cards. A device driver scheme for MIDI software would free users from a limited choice of interface devices, and open up MIDI software to those of us who are locked out entirely by lack of expansion slots. This would also encourage "portability," the ability to run the same software on different hardware configurations. *Bob Haas, Tualatin, OR.* EM

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ACCESSORIES/INTERFACES

X4 ($99.50) expands Drumulator song and segment memory four times. **X8** ($169) provides eight times as much memory. Easy installation, pushbutton bank select with LED bank display. SD Simpson Elec., Rt. 4, Box 614, Salem, MO 95560. Tel. 314/743-6170.

The **Austin MIDI Interfaces** ($79.95) for the Macintosh and Mac Plus feature one MIDI input, two MIDI outputs, and a 1 MHz clock speed. The interfaces, designed by **EM** author Kirk Austin, plug into either of the Mac's two serial ports and have their own power supply to avoid drawing current from the computer. Austin Development, 211 The Alameda, San Anselmo, CA 94960.

The **Garfield/9000 Card** ($449 including installation) adapts the Linn 9000 drum machine for SMPTE time code when used with the Garfield Master Beat synchronizer. The card also provides a second input that reads MIDI clocks and allows for merging of separate MIDI clock and note sources. K-Muse, 8954 Mason Ave., Chatsworth, CA 91311. Tel. 818/998-7555.

Rackspace 29-inch high equipment rack kits are delivered ready to finish and require only a screwdriver, glue, and pliers to assemble. They are stackable and provide desktop height surface space as well. Prices start at $165. Woodhaven Products Company, 430 West Browning Road #C8, Bellmawr, NJ 08031. Tel. 609/933-3018.

COMPONENTS

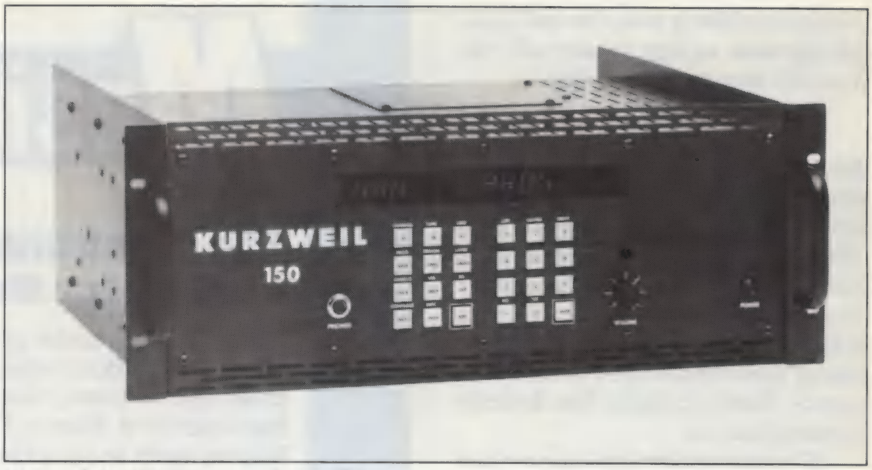
The **PCM53, 54,** and **55** (under $11 in hundreds) are monolithic, 16-bit PCM DACs with 0.0025% maximum THD and 96 dB dynamic range. The **PCM75** (from $87 in hundreds) hybrid PCM A/D converter features parallel or serial outputs and 17 μsec maximum conversion time. Burr-Brown, P.O. Box, Tucson, AZ 85734. Tel. 602/746-1111.

LIGHTING

Micro-Plex lighting control products feature up to 128 memory locations with automatic scene-to-scene crossfade, chase, and freeze. Nova Systems, Inc., 28170 S. W. Boberg Rd., Wilsonville, OR 97070. Tel. 503/682-1941.

SIGNAL PROCESSORS

The **RV-3** digital reverb's ($599) programs include two different plates, two sizes of rooms, two types of halls, gated reverb, and reverse reverb. The easy-to-program, mono in/stereo out device features a 79 dB dynamic range and 14 kHz bandwidth. Furman Sound, 30 Rich St., Greenbrae, CA 94904. Tel. 415/927-1225.



Kurzweil K150 MIDI expander module

SOFTWARE

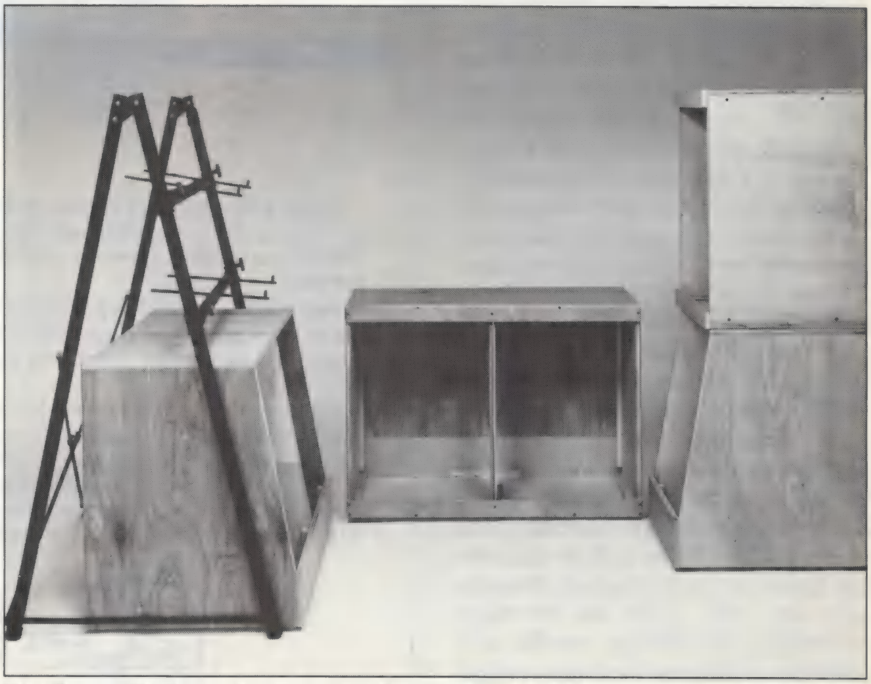
16 CZ Voice Programs, presented in data sheet form, are available for the Casio CZ series of instruments. Blacet Research, 18405 Old Monte Rio Rd., Guerneville, CA 95446. Tel. 707/869-9164.

Patchmaster 100 ($39.95): 100 sound data sheets for CZ-101 with cassette demo tape. **Patchmaster 200** ($39.95): C-64/128 Floppy disk with 208 patches. Specify Dr. T or CZ-Rider format. Presence Sound Productions, 228 Bleeker St., New York, NY 10014.

D.M.S. 1 ($145 by International Money Order exclusive of taxes) is a real time, 8-track sequencer/recorder for the Yamaha CX5M. Clavius Micro/Music Store, 129 Faubourg du Temple, 75019 Paris, France. Tel. 42-49-59-39.

SampleScope ($149.95) is a Commodore-64 compatible waveform editor for

Buchla & Associates, manufacturers of electronic musical instruments, will conduct a moving sale of surplus components, synthesizer parts and modules, computers and peripherals, keyboards, tape recorders, S-100 cards, and other sundry items. Time: September 19, 20, and 21, 10 a.m. to 6 p.m. Place: 1740 Arch St., Berkeley, CA. For more information write P.O. Box 5051, Berkeley, CA 94705.



Woodhaven "Rackspace" equipment racks

the Akai S612 sampler. It can save samples on standard 5.25-inch disks using a Commodore disk drive and operates almost entirely from joystick control. Ultimate Media, 275 Magnolia Ave., Larkspur, CA 94939. Tel. 800/334-2447 (outside CA) or 800/228-6244 (inside CA).

The **TnS** ($150) music "spreadsheet" for the IBM PC/MPU-401 features both real time and step time recording, 85,000 note capacity with 640K computer, 96 cue points, and crescendo/decrescendo. The MIDI Connection, P.O. Box 282, Station D, Montreal, Quebec, Canada H3K 3G5.

Sound Lab Version 1.1 ($395; free update to owners of version 1.0) accommodates the Mac Plus and Mirage rack-mount Multi-Sampler and includes several new features. Blank Software, 1034 Natoma St., San Francisco, CA 94103. Tel. 415/863-9224.

D-XTC ($54.95) patch librarian software for the C-64/128 provides instant view of three banks of software, move/swap patches, patch name printout, and fast operation. Compatible with Data Dumpstor MIDI files and comes with 64 patches. Specify DX100/21/27 or DX7/TX version. Music Service Software, 801 Wheeler Rd., Madison, WI 53704.

SPEAKERS

The **M1** near field studio monitor ($129) is a two-way acoustic suspension model optimized for engineers who reference recordings to automotive playback or stereo television. It uses a four-inch woofer and one-inch soft dome tweeter. Delta-Lab, One Progress Way, Wilmington, MA 01887. Tel. 617/658-5100.

SYNCHRONIZATION

The **SM-9** SMPTE-to-MIDI controller and **US-8** Universal Synchronizer (a device capable of translating between numerous timebase systems), both made by the British company Bokse, are now distributed in the U.S. by Symetrix, 4211 24th West, Seattle, WA 98199. Tel. 206/282-2555.

SYNTHESIZERS

The **K150** ($2,995) is a multi-timbral MIDI expander module with 22 resident instrument voices capable of being configured into 60 programs. Provisions are included for five expansion ROMs to add more sounds at a later date. Kurzweil Music Systems, 411 Waverly Oaks Rd., Waltham, MA 02154.

All prices are suggested retail prices, as supplied by the manufacturers. All prices and specifications are subject to change without notice. EM

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Released and Reviewed

Neil, *Heavy Concept Album* (Warner 240 524-1). Nigel Planer plays Neil, the dim-witted hippie on the British comedy "The Young Ones" (currently showing on MTV). Like any good hippie he's stuck in 1969. The cover is a take-off on *Sgt. Pepper's* and he sings songs by Pink Floyd, Donovan, The Incredible String Band and Caravan. There are also a couple of fairly serious original numbers. In between are spoken vignettes in character, with the whole thing tied together by a loose storyline about "making an album". The interesting bit is the cast of musicians: Dave Stewart, Pip Pyle, Jimmy Hastings, Annie Whitehead, Barbara Gaskin—the best of Canterbury.

Cliff Sarde
TAXI
WAITING

Cliff Sarde, *Waiting* (MCA 5704). A track from this album was featured on *Miami Vice* back in February, which isn't surprising since the whole album has a kind of Jan Hammerish jazz-rock feel to it. Sarde (not pronounced SHAR-DAY) plays very hip small, medium and large saxophones backed by lots of synthesizers and a drum computer.

Skywalk, *The Bohemians* (Zebra 5715). On their first album (reviewed 4/86) I described them as "a keyboard-led jazz group", but that doesn't really hold for *The Bohemians.* They've developed into such a tight cohesive unit that all six members seem to be leaders. In fact, the guitarist gets most of the good solos on his Roland GR700, but like Cabo Frio, soloing isn't much of the fabric of the music. Mostly it's just tight ensemble playing in intelligent, rapidly shifting settings.

37 Targetz, *...And It Burns* (Skippy The Healing Pig 1001). Yet another rock band where hairdos and shoes define the style. They're competent enough but haven't an original thought between them. P.O. Box 707, Chattanooga, TN 37402.

Cabo Frio
RIGHT ON THE MONEY

Cabo Frio, *Right on the Money* (Zebra 5685). Cabo Frio is a hot fusion quintet from Spyro Gyra's home town, Rochester. Musically, they are a shade less "tropical" than their famous neighbors, substituting tight funky tunes with carefully controlled sax, guitar and synthesizer solos. They also show their urban roots with a soul-vocal number and a rap piece, neither of which sounds particularly out of place. The reedman, Terrance Bruce, deserves special notice, dropping sly quotations into his solos and playing with enthusiasm and authority throughout.

Frank Zappa, *Meets The Mothers of Prevention* (Barking Pumpkin 74203). Funny, isn't it, how time changes everything? Twenty-three years ago Zappa was arrested for pornography and today the biggest selling album of his career is about censorship. The centerpiece is the 12-minute "Porn Wars", a Musique Concrete piece based on the Senate hearings on obscene lyrics. Zappa is generally acknowledged as the star witness of those proceedings. Unfortunately, the piece itself and the album that surrounds it do little to bolster the cause of artistic freedom, using four-letter words to no higher purpose than shock value. Sad that his new fame as a spokesman for freedom comes at a time when his "social relevance" is at an all time low.

Scott Johnson, *John Somebody* (Nonesuch 9 79133-1). Using tape loops of spoken voice as the rhythmic and sometimes melodic springboard, Johnson adds guitar and bass and creates progressive rock music based on the rhythms of speech. Unlike Laurie Anderson, who also uses short samples of speech as percussion, Johnson build very three-dimensional instrumental music which expands on the vocal material in a couple different directions.

Operation Help

Operation Help *is dedicated to helping musicians help each other. If you need technical assistance, a schematic for some old piece of gear, or just want to connect with people having similar interests, send your name, address, phone number (optional), and nature of your request to* Operation Help, Electronic Musician, *2608 Ninth St., Berkeley, CA 94710. There is no charge for this service, but we cannot guarantee that all requests will be published.*

Joe DePiola: You queried with a great idea for an article but we have no address! Please write to **EM**, 2608 Ninth St., Berkeley, CA 94710.

Mountain/MIDI Connection: Does anyone know of any software that allows you to take input from a MIDI compatible keyboard and play music on the Mountain Music System for the Apple II+? Ray L. Artz, 20881 N. E. 2nd Ave., Miami, FL 33179.

Akai AX-80 User Group: I'm interested in finding or forming an Akai AX-80 user group to exchange patches and tips. If such a group already exists, please let me know. David C. Diener, 105 Niles Hill Rd., New London, CT 06320.

Korg Gear, MIDI-to-CV: I'm looking for Korg MS-20, MS-50, and SQ-10 monophonic analog synth equipment. I also need schematics or info on kits for an inexpensive MIDI-to-CV converter. Philip Perkins, 171 South Park, San Francisco, CA 94107. Tel. 415/543-6661.

Public Domain Amiga/Atari ST software: What is available in public domain Amiga and Atari ST software, and how does one find the stuff? Craig Anderton, **EM**, 2608 Ninth St., Berkeley, CA 94710.

Amiga-to-MPU-401, PCM Recording Problems: Is anyone supporting the MPU-401 on the Amiga? Also, I am getting a sputtering sound on cymbals and "esses" when using a Nakamichi DMP-100 PCM adapter and VCR for mixdown. After several tests, I found this was independent of level and the DMP-100 itself does not seem to be at fault, thus leading me to suspect the VCRs. The problem seems to correlate to tape speed and tape brand, which leads me to believe that video bandwidth is the culprit. What's the right tape deck and right tape to use for this application, or does the problem lie elsewhere? Kirk Clendinning, P.O. Box 200937, Austin, TX 78720. **EM**

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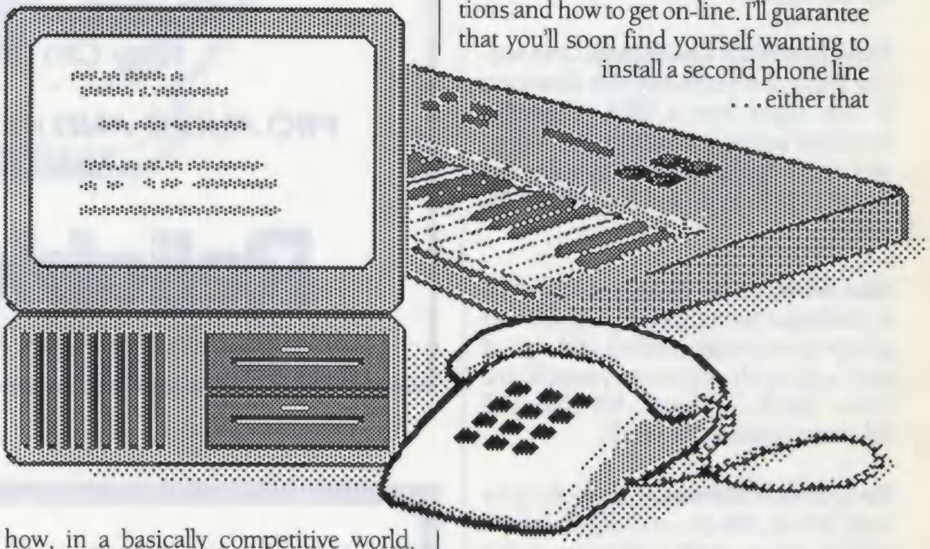
Everything you ever wanted to know about musical electronics may be just a phone call away—and here's how to join in on the fun.

Telecommunications for Electronic Musicians

BY STEVE SAGMAN

This article travelled by telephone line from my computer in New York to Craig Anderton's computer in California over the Esi computer network. After being edited, the article will go via (again) Esi to Mix Publications, where the file will be directly loaded into their typesetting equipment. No paper. No postage. No Federal Express . . . amazing.

I knew this article would be a delight to write. I purchased my first computer several years ago (a portable NEC 8201A) to take advantage of the computer communications services that had just begun to spring up. Now, my computer, my modem, and I are inseparable. What used to be just a word processor on my desk has become an electronic window just waiting to be opened each day. What used to spew back only whatever I had put in now can deliver more information, messages, music and pictures than I could possibly ever absorb.



Even the biggest names in music pick up new music-making tips from their friends. And, if you're part of a MIDI users group, or if you simply get together with other players from time to time, you've experienced the gains that can come from sharing your ideas about MIDI music-making with other people. But, getting together isn't always so easy, and somehow, in a basically competitive world, you may find your friends are understandably reluctant to part with those incredible new patches they've struggled so hard to create and told you about so often.

Remarkably, though, there is one place where our natural hesitancy to divulge all our hard-won secrets seems to disappear—the stunning, ultra high-tech, and truly addicting world of telecommunications. Here, virtually anybody can make his or her wisdom available to the world and become instantly published.

By now, you've heard about home banking by computer and making airline reservations from your home terminal, but these are only a hint of the range of services available to anyone with a computer hooked to a telephone. Most people use telecommunications to send instant electronic mail to each other, but the data you can send is not limited to text. Generally, if you can store something in your computer, you can send it over the phone. This even includes sequences, samples, and synth programs.

Some people use telecommunications to dial into Bulletin Board Systems (BBSs), which are computers tied in to a specific phone number. Bulletin boards collect and disseminate chat, stories, and information files on just about any subject. Other telecommunicators get involved in the national networks. Thanks to several major computer services that employ large mainframe computer installations and special nationwide telephone networks, you can become part of on-line, cross-country user groups. These meet for regular conferences, exchange messages, and let you zap your latest sequences and sounds to other members throughout the U.S. and around the world. Let's take a look at the process of telecommunications and how to get on-line. I'll guarantee that you'll soon find yourself wanting to install a second phone line . . . either that or you might sacrifice your friends to a constant busy signal!

DATA TRANSFER BETWEEN COMPUTERS

In its simplest form, a computer is nothing more than a somewhat-intelligent data handler that makes informed decisions about where data should properly flow within its own box. The main microprocessor directs this stream of information within the computer to and from the keyboard, screen, disk drives and other devices. To transfer data to the outside world, the computer must have a *serial port* that sends data out on a bit-by-bit basis (and for music data you also need a MIDI port, which is really nothing more than a jazzed-up serial port). In the past, serial ports were almost always optional equipment. Also called *RS-232 ports* and *asynchronous communications adapters* (ACAs), they needed to be bought separately and installed. Now, many computers come with at least one serial port as standard equipment.

If you are hooking two computers together, you need only connect a specially wired "null-modem cable" between

***Steve Sagman** edits* MIDI MARKETER, *a trade magazine for the electronic musical instrument business, and is a confirmed modem addict (You should see his phone bills!). His New York-based jazz trio, "The Catatonic Three," has been hailed for its "bold unobtrusiveness," and he's about to install a new, "trunk" power line into his NY apartment to serve all the MIDI gear. Steve welcomes e-mail at the following addresses: Delphi/PAN: STEVES; CompuServe: 72456,3325; IMC: SAGMAN-US; The Source: BCK 106 and on BBSs around the world as "Steve Sagman."*

their serial ports to enable data transfer. But, if you intend to send that information out over a phone line, you'll need a modem. Telephone lines are capable of transmitting only audible sounds. So, to send digital information, the data must be encoded into tones. Without getting too technical, because then I'll get lost, digital pulses are converted to and from high and low tones by a modem. This process is called *modulation* and *demodulation*. Now you see where that strange word "modem" comes from: MOdulation and DEModulation, the encoding and decoding processes, respectively. Alan Campbell's article in this issue describes everything you need to know about choosing a modem. Suffice it to say, for now, that you'll need a modem and telecommunications software in order to begin; the sidebar describes the types of communications parameters that need to be set with your software in order to communicate properly with the outside world.

MAKING YOUR CONNECTION

The prospect of logging onto another computer may seem intimidating, but the mystery quickly clears after you've done it once. Actually, it's mostly automatic. Whether your modem has dialed for you or you dial the phone manually, the remote computer will answer and you'll hear a high-pitched tone if you listen on line. Your modem will respond with its own carrier in a process called "handshaking." Once each computer knows the other one is there, you're off and running.

Some software will allow you to preprogram telephone numbers for the modem to automatically dial. Once a connection is established, the software will also automatically transmit your identification codes, passwords, and even initial instructions to the remote computer. With simpler software, you may need to enter everything by typing on the keyboard. In this case, you'll need to know a bit more about how a connection is made.

Any BBS or computer system you call will have been set to automatically answer the phone after a ring or two. When it does, it sends a *carrier tone* and waits for one from your modem. In order to get your modem to send a carrier, you must type in an instruction for it to pick up the phone line (the same as lifting the handset off the telephone), then send a tone of its own. (The command for Hayes-compatible modems is "ATD"; other modems have their own commands which you'll find in their manuals.)

BROWSING AROUND

Once handshaking has occurred between the two computers, the remote computer will send a welcoming message (this lends a homey touch as it flashes on your screen), and you may begin typing commands just as if you were sitting at a terminal right at the computer site. Most commands have been standardized among the smaller Bulletin Board Systems (for example, typing "G" usually means "G"oodbye) and the larger services, like CompuServe, have their own commands to be learned from their manual. Generally, you'll be choosing from *menus*, just like the software you use in your own computer; the remote system will respond by scrolling through messages left by other users or sending files from databases through which you can browse. Whatever you type will be sent through your computer's serial port to the modem, out over phone lines to the remote computer's modem, and then into the service's main computer. Then, instantly, it will be "echoed" back to your computer's screen so that you can confirm the information arrived all in one piece. So, generally, what you see on your screen has already made a long voyage, sometimes across country and back.

While you are on-line with another computer, you may choose to simply read through messages, files, or anything else that's available. In this case, they just scroll off the screen. If you choose, you may *capture* them (i.e. store them in memory) by issuing the proper command to your communications software. Once the information resides in your computer's memory, you may print out the "session" and re-read it, or save it on disk for later retrieval. Or, during the session, you may send everything to your printer in order to have a "hard copy" record. Early terminals were strictly printers and had no video screens—everything the operator typed or received over the phone line was sent to an attached printer. These days, we have the chance to be much more economical with paper.

TRANSFERRING FILES

Before long, you will be transferring files back and forth between your computer and a remote system like a pro. These files may be electronic mail, computer programs, or even articles such as this. Several special "protocols" are available to ensure error-free transmissions.

Letters and such are sent as *ASCII files*. ASCII stands for American Standard Code of Information Interchange, and specifies the byte format for different letters, numerals, and some special characters. However, static on phone lines and a multitude of other gremlins can distort some of this information. If the file is just a routine message, one of its individual characters may be missing or wrong, which at worst can be a little embarrassing. However, if the file is, for example, a computer program or MIDI sequencer data, every byte must be accurate.

For these critical files, the most popular communications protocol is called XMODEM. This software scheme breaks your file into 128-byte blocks. Another byte associated with each transmitted block indicates a mathematical calculation of the values of all the characters sent in the block. If the total received does not match the total sent, the receiving software automatically requests that the block be re-transmitted. The blocks are re-constructed on the receiving end into an exact, error-free copy of the original file. To initiate an XMODEM transfer, you must issue the appropriate command to upload a file to the remote computer or download a file from the remote computer using XMODEM. Once you've specified the file name to be used by each computer, the transfer will begin automatically, block-by-block. The hardest part of using XMODEM is the boredom of waiting for it to finish. The trade-off for accuracy is slightly slower transfer.

Besides error-checking, XMODEM has another, sometimes more important use. The ASCII codes (alphanumeric characters and symbols) we use in simple text messages consist of only the first 128 out of 256 possible combinations of bits (1s and 0s) in an eight-bit byte and thus can be expressed using only seven bits. Why? I was afraid you'd ask. The explanation involves binary arithmetic, in that only seven bits are required to express 128 possibilities. For now, it's enough to recognize that transmitting the full 256 possible bit combinations in a single byte, necessary when sending computer programs and certain other files (such as sequences and samples), requires sending a full eight bits at a time and that's where ASCII transfers fail. XMODEM requires that you transmit all eight bits so it's the protocol of choice.

Several other protocols, including Kermit, X.PC, and MNP are coming into vogue. You are sure to see informative articles about using each of these new standards in upcoming computer magazines.

Finishing a session usually involves

nothing more than typing "off," "bye," or "quit." Never simply turn off the modem or tell the software to hang-up; most BBSs can adjust to sudden disconnects, but the large services may not recognize your absence without a proper sign-off. If they think you are still on-line, they will go on charging you for "connect time" and you won't realize your mistake until you get the end-of-the-month bill.

GRASSROOTS COMMUNICATIONS

Even with all the available options, some people stick to grassroots telecommunications. Here, you are dialing directly into another person's computer, which has been preset to answer the phone and begin a "session" with you. In a world where very little comes for free, people have actually dedicated their computers to providing these BBSs and most require no sign-up fee for access. (If they do, it's a minimal yearly charge to help defray some of their costs.) There are literally thousands of BBSs all over the country, many specializing in software and services for one particular computer brand or one community's interest. For my little NEC 8201A computer, I dial into one or another of about a half-dozen BBSs around the country supported by portable computer owners or portable computer users groups. For my IBM PC-compatible, the choices are much greater and I can pick from any of 15 to 20 BBSs which are all within a local phone call.

Finding your first BBS is the hard part and may require a bit of sleuthing. When I first got involved, I knew local BBSs existed, but where? (And you can forget the "War Games" random-dial bit as you'll only cause a bunch of irritated phone answerers.) Try a local computer store and ask them if they know of any good local BBSs. Invariably, once you successfully log on to one, you'll find a list of many others. Each board will lead you to several new boards until you've suddenly compiled a huge list of telephone numbers.

COMMUNICATING ONE-ON-ONE

Once you have met other computer users in your area through a MIDI users group or the local computer store, you may want to use telecommunications to send files back and forth person-to-person rather than having to exchange diskettes.

If one of you has a modem with auto-answer capabilities, you're all set. You, or the other person, will simply type in a command that instructs the modem to automatically answer the next incoming call. Then, the procedure is the same as calling a BBS. When you communicate directly with another individual's computer, you must agree, in advance, upon the settings you will use.

Once one of you has called into the other's computer and handshaking has occurred, you can type messages to one another. Whatever you type will instantly appear on the other's screen. It's a painfully slow way to communicate, but it establishes communication and you can tell each other when you're ready to send or receive a file. When communicating computer-to-computer, you may have to set your communications software to half-duplex (see sidebar). This is only necessary if the other person's software does not echo your keystrokes back to your computer. In that case, the software will "local echo" your typing directly back to the screen. You can see the effect when you go half-duplex while connected to a normal BBS expecting full-duplex. You'll think you're seeing double. Everything will visually echo—once from the remote computer and once from your own software!

MUSIC-ORIENTED BBSs

More and more BBSs are springing up sponsored by musicians and dedicated to MIDI and electronic music; see the other telecommunications-related articles in this issue for more information. For now, let's pretend that we've logged on to

It's My Parity and I'll Baud If I Want To...

In this highly non-standard world of ours, not all computers communicate in the same way. Before you can establish a connection with a remote computer, you must be certain that your communications settings match those used by the remote computer. Altering the settings is performed within the telecommunications software. The most important settings are described here.

BAUD RATE

The Baud rate of transfer is the speed with which your data is communicated. Generally, "Baud" refers to bits per second. The two most common rates are 300 and 1200 Baud. Many portables and home computers have modems that work only at the slower 300 Baud, while professional computers commonly have 1200 Baud modems. 2400 Baud is currently the rage, though, and the cost of 2400 baud modems, while still high, is beginning to come down.

Many of the commercial telecommunications services can support all three Baud rates, and while some charge an extra fee for higher speeds, you will usually find it most economical to transfer files at the highest rate available to you.

Commercial services and BBSs that use auto-answer modems will automatically adjust to the speed of your modem when you first log-on.

PARITY

The two most common settings for parity are EVEN and NONE. As a primitive form of error-checking, even parity requires an additional data bit to be sent along with each transmitted seven-bit character. The eighth bit is either 0 or 1 depending on which will make the bits of the character add up to an even number. If an odd number of bits comes through, the receiver knows that the transmission is in error. When all eight bits are used for data, as in an XMODEM file transfer, the parity is set to NONE. Other settings you may find as options are rarely used.

STOP BITS

The stop bits setting determines the number of bits that mark the end of each transmitted character. One stop bit is the setting used by almost every communications service.

Often these three settings are specified as "N-8-1" or "E-7-1." These would be interpreted as no parity, eight bits, one stop bit, and even parity, seven bits, and one stop bit, respectively.

If you are planning on simply browsing through a database or reading messages, E-7-1 will usually work just fine. If you intend to perform error-checked file transfers, though, you should sign on with your settings at N-8-1. Most BBSs will respond correctly with N-8-1, and commercial services will quickly adjust to it after a line or two.

HALF/FULL DUPLEX

In half duplex mode, what you type is displayed directly on your screen. In full duplex mode, what you see is your typing echoed back by the other computer.

DISPLAY MODE
GENERATOR
EDIT
NORMAL
REAL
RELATIVE
HOURS
MINUTES
SECONDS
FRAMES
SF
23.10.11.15.8
BAR
MEASURE
BAR
BAR
MEASURE
/24
TEMPO
NORMAL DISPLAY
RELATIVE RESET
TIME BASE
GEN RUN
MEMORY BANK
TRIM
RECORDER ENABLE
MIDI SYNC
MIDI ENABLE
PRE-ROLL
AUTO PLAY

IT'S ABOUT TIME

Finally, someone tied everything together — MIDI, SMPTE and the tape recorder — in one smart package. The company is Fostex and the product is the Model 4050. Much more than an autolocator, it provides a level of automation never before available.

Now musicians and songwriters have direct access to SMPTE time code, the universal time standard. Sync all your MIDI clocks and the tape recorder to SMPTE for rock stable timing.

Program and edit with a new level of confidence and accuracy. Features include:

- Up to 100 cue point memory for autolocate on Fostex Models 80 and 20, B-16 Series and all E-Series.
- Automatic programmable punch-in/out.
- Complete control of MIDI start time, tempo, meter and length of song.

The 4050 is the first autolocator to think musically.

- Recognizes MIDI Song Pointer.
- Selectable Pre-roll up to :99 sec.
- Built-in SMPTE Time Code Generator/Reader — all four formats.

When your timing reference is SMPTE, you're in sync with *the* professional standard, worldwide.

Plus, the door to video is now wide open. Especially with the amazingly affordable Fostex synchronizer, Model 4030.

So hurry on down to your Fostex Personal Multitrack Dealer and put a 4050 into action. Because now's the perfect time.

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a typical bulletin board, handshaking has been established, and an introductory menu has appeared. Shown at right is a fairly typical communication.

Everything in bold is a command you will have typed to our fictional MIDI BBS. Everything in italics are clarifications I have inserted for explanations. The first thing you see tells you what you're hooked up to and the system status; the computer will also want you to identify yourself.

THE INFORMATION PROVIDERS

The main drawback with BBSs is that they are often one-caller-at-a-time—the previous caller must log-off before you can hope to avoid a busy signal. And, believe me, those constant busy signals can drive you crazy!

A number of large computer communications services have sprung up over the last several years. Several of the largest are CompuServe, The Source, Dow Jones, Delphi, and GEnie. Companies who had been in the business of leasing computing time on their giant, mainframe computers recognized the opportunities for additional revenue by opening up their systems to individuals in the evening, after business hours. Most services require an initial sign-up fee and then charge you for connect time by the hour or part of an hour. They all handle multiple callers at once, giving each a brief moment of attention, over and over at an unbelievably fast rate.

These services offer a wide variety of options, ranging from airline reservations to multiple-user conferencing and special-interest groups (SIGs). Major manufacturers have opened customer support areas on several of the networks and you will often find software updates or special programs for use by product owners in databases available for your browsing.

PAN's "MIDI Development and Synthesizer Forum" is, in my opinion, the premiere music-related forum. Within CompuServe, The Music Forum has many active members and a lively sub-topic on synthesizers.

Starter kits for CompuServe are available at many computer stores. These provide an initial password and several hours of free connect time for you to learn the system. Signing up with other systems is simply a matter of calling and making the arrangements. For each, you will receive a local access number and a password.

CompuServe has its own national local-access telephone number system. Most others require you to log-on through a telecommunications access service like

A TYPICAL BBS CONVERSATION

```
NET-MIDI BBS
PCBoard Software - Ver. 10.0 - 01/08/86
System up at 19:12 on 09-15-1986 at 1200 Baud.
Want color graphics (C/R)=no? RETURN
(C/R stands for carriage return. In this case, a carriage return gives no. To select color graphics,
you would type Y or YES.)
What is your first name? STEVE
What is your last name? SAGMAN
Checking user file. Please wait...
Password (Dots Will Echo)?...... (This is the password you chose during your first
log-on.)
WELCOME TO NET-MIDI BBS. The East Coast's Definitive Information Source for
MIDI Users and Abusers.
Good evening Steve. Check your mail today (C/R)=yes?
RETURN
Checking Main Board Messages.........
Sorry Steve, no Main Board mail for you today.
(87) New Main Board messages have been left.
(Next comes some data about your status on the system.)
You are caller number 2,463
Lst Date On: 08-19-86 # Times On : 10
Page Length: 23 Expert Mode: Off
Security Lv: 45 # Downloads: 14 # Uploads : 4
L/Msg. Read: 232 Next Msg. #: 244
Tr/Protocol: Xmodem
NET-MIDI BBS Main Board Commands
==( Main Menu )
==============================================================
A)bandon Conference     J)oin a Conference     R)ead Messages
B)ulletin Listings      K)ill a Message        S)cript Question
CHAT between NODEs      L)ocate Files(Name)    (for Newusers)
C)omment to SYSOP       M)ode (Graphics)       T)rans. Protocol
D)ownload a File        N)ew Files(Date)       U)pload a File
E)nter a Message        O)perator Page         V)iew Settings
F)ile Directories       OPEN a DOOR            W)rite User Info
G)oodbye (Hang Up)      P)age Length           X)pert On/Off
H)elp Functions         Q)uick Msg Scan        Y)our Per. Mail
I)nitial Welcome                               Z)ippy DIR Scan

(43 min. left) Main Board Command? F
(This chooses the "File Directories" option to see what's available.)

                         FILE DIRECTORIES
1) Business / Home Finance         7) Games & Other Diversions
2) Communications                  8) Word Processing / Database
3) Printer Utilities               9) Text & BBS Files
4) Hard Disk Utilities             10) Everything Else (Misc.)
5) Misc. Utilities                 11) Sequencer Files
6) Graphics                        12) Sampler Files
                      99) New Uploads (Thanks !!!)
Directory(s) (1 - 12 or 99), (D)ownload, (L)ist, (C/R)=none? 99
(This selects option 99, "New Uploads," which causes a new screen to be displayed.)

                        BBS DIRECTORY # 99
                        N E W  U P L O A D S
WELCOME to Our New Files !!. This list represents files uploaded by you users.
Uploading files is the best way to gain access time on the board, so please contribute.
T H A N K S  F O L K S ! ! ! !

CAL.COM          1024 03-31-86       INSTANT CALENDAR BASED ON SYSTEM
                                     DATE
```

```
COOKIES.TXT     1280  04-09-86   Mrs. Fields Cookies Recipe...top Secret
TD.ARC          6656  05-01-86   TREE DIRECTORY PROGRAM
POPCALC.ARC    14336  05-01-86   Simple pop-up calculator
BACH.BAT        5760  06-04-86   Bach Sonata
MIDIEX.ARC     24448  08-06-86   MIDI DX7 (Synth) System Exclusive Tool
212.ARC         8832  08-12-86   212 Area Code BBS List Aug. 15, 1986
NITEFIRE.ARC   29696  08-14-86   2-person tank battle-game
```

(This shows the file name, the number of bytes taken up by the file, the date posted, and a short description of the file.)

```
Directory(s) (1 - 13), (D)ownload, (L)ist, (C/R)=none? D
```

(This tells the host computer you want to download a file.)

```
Enter the full filename to download? COOKIES.TXT
Checking file transfer request. Please wait ...
Download Time: 0 min. and 32 sec.
Download Size: 14 blocks 1280 bytes
Total So Far : 0 blocks 0 bytes
Total Will Be: 14 blocks 1280 bytes
Transfer aborts if not started within 40 seconds.
Ready to send using Xmodem. (Ctrl-X) to Abort.
```

(Here you would type whatever commands necessary to have your communications software begin an XMODEM download. After the download, you should see something like...)

```
Download successfully completed.
(39 min. left) Main Board Command? G
```

(This tells the host you want to say "good-bye," i.e., hang up and log off.)

```
Time Logged: 5 minutes
Time Used: 5 minutes
Thanks for calling Steve ...
```

That's the end of the session, and you're back in the real world.

Tymnet or Telenet. These offer a local phone number and carry your data to and from the host computer. Their charges are usually built into your per-hour connect time charges.

SHOPPING BY COMPUTER

One of the most interesting new developments is the concept of shopping by computer. CompuServe has long had Comp-u-Store, where a purchaser can browse through an on-line catalog of merchandise and then order by credit card. Several new services have sprung up for the musical equipment purchaser on the established networks. They offer 24-hour shopping and a wide variety of MIDI-related products.

LOG-OFF

I'm certain you'll quickly become a modem fiend once you've learned just how much is available on-line, and you don't even have to leave home. When you do get on-line, drop me a note. I'm way behind on everything else, but somehow I always have the time to return e-mail. I'm addicted. It can be an expensive habit, but it's one of the few positive addictions I know! EM

PROMIDI™ STUDIO SYSTEM SDA-200

BRINGS NEXT GENERATION TECHNOLOGY TO YOUR MIDI RECORDING & EDITING:

Real-time Directly to Disk: Recording length *and* number of recordings/tracks limited *only by disk space.* No arbitrary track length. And your music is on disk immediately, instead of in volatile RAM.

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Help Screens: Over 150K of context-specific HELP *right in the software,* along with a 90-page manual with illustrations and examples.

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System requirements: IBM PC or compatible, 256K, monitor, MIDI instrument(s).

COMPLETE: Midicard interface, software, cables and user documentation. **$599.00**

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SAM ASH White Plains, N.Y.
STRAIT MUSIC Austin, TX

If the time has come for you to step into the high-tech world of telecommunications, this article will tell you what's available and even how to sign up.

Telecommunications Services

(Editor's note: To obtain information about some of the major telecommunications services, I of course used electronic mail. Except for the story on Esi, the following pieces about music-oriented networks were written by the people who are primarily responsible for their respective telecommunications services and thus represent their visions of the services. Later on, Jack Orman talks a bit about other, more general systems, as well as independent Bulletin Board Services; and to close out the section, we'll cover some of the problems involved in telecommunicating.)

Esi Street

BY RICHARD ELEN

Like many great ideas, the concept behind Esi Street was a simple one: to bring electronic computer communications to the entertainment industry. Yet when Don Singleton, an American living in London, conceived the idea over three years ago, he can hardly have imagined how successful his brainchild would become.

Singleton (who had a background in marketing and the applications of electronic mail to big business) noticed that while electronic mail was generally sold to large multi-national corporations, there was a huge, and untapped, market which relied instead on linking small companies—and even individuals—with a common interest. Due to Singleton's past experience of the music industry, IMC (acronym for International Management Communications) began by connecting bands on tour with their management companies and offices. This would not have been possible without two technologies: electronic mail networks that could be accessed with a local phone call from virtually anywhere in the world (ITT's Dialcom service, which is now owned by British Telecom, was well-placed in this respect); and portable computer systems that could be taken on the road, hooked up to a modem or acoustic coupler in some distant hotel room, and coupled to the phone line.

IMC began in England, but soon after, the United States and Australia were linked as well. The service rapidly gained the industry's respect, and expanded beyond the original business of providing communications on tour to involve record companies, music publishers and other services associated with the industry.

Due to these changes, in 1986 the company changed its name; deciding that a suitable metaphor was that of an "electronic street" on which you could find lawyers, record companies, music publishers, tour management outfits, travel agents, recording studios, and even an industry journal, IMC became Entertainment Systems International—"Esi Street."

Over the few years of its existence, Esi has added a large number of facilities to the basic Dialcom service, thus improving its ease-of-use to end users who vary dramatically in their computer literacy and technical knowledge. In fact, Esi is almost unrecognizable as a Dialcom service and after a couple of hours of training, anyone can make use of Esi's facilities.

Such developments do not, of course, come cheap—although Esi's rates are competitive with most other systems. There is an initial sign-up charge of $200, total connect time charges of approximately $16.50/hour, and additional charges for storage and overseas mail. But for the 3,000 or so professional music business companies and people that rely on the system for their day-to-day business, where reliable, accurate communications is a primary requirement, Esi fits the bill. Not only can you communicate instantly with the people you need to talk to, but you can also check the charts from *Billboard, Album Network* and *Radio & Records*, read the music business news, and look at the bulletin board discussions on topics of current interest.

It must be remembered, however, that Esi is primarily designed to service the straight business side of the industry. There are several pro-audio companies handling on-line support via Esi: the Society of Professional Audio Recording Studios (SPARS) is there; the Solid State Logic (SSL) Users Group has an on-line forum; and Synth-Net, a MIDI/synthesizer group based in New York (see related story) offers information and discussion, downloadable sounds, and other services. The main characteristic of Esi and its users is that they are all professionals who *need* to get in touch *now*—without the hassles of chasing someone on the phone, being tied to the office telex machine, or waiting for the mail.

For more information on IMC, call the office nearest you: Los Angeles, 213/937-0347; New York, 212/757-0320; London (U.K.) 01/221-2749; and Sydney (Australia) 02/516-3622. There is also an 800 number (800/FAST-ESI) that is good everywhere but New York State.

***Richard Elen** is an engineer, producer, and the former editor of the British publication* Studio Sound. *He contributes regularly to* Mix *magazine and has been the electronic publishing consultant to Entertainment Systems International for the past three years.*

MusicNet: For the Active Electronic Musician and Composer

BY JULES DELGADO

MusicNet has several goals:

1. To keep you informed about new products.
2. To give technical information and advice about their use.
3. To provide the musician with a network of fellow composers and performers with whom to share experience and ideas.
4. To foster the development of MIDI and the use of computers in music.
5. To provide new patches monthly for various synthesizers, establish a direct link between users and software/hardware manufacturers and finally, offer online shopping for computers and periph-

erals as well as public domain software (both music and non-music related). In other words, MusicNet is here to help you enjoy the age of electronic music.

New products will be announced here well before they hit the newsstands. There will be weekly in-depth reviews of new products. You will also be able to request literature directly from various manufacturers.

By the use of our mail system, you will be able to share your ideas and experiences with the entire membership of MusicNet. Those of you who wish to be listed can send each other messages regarding your interests.

MusicNet is accessible 24 hours a day, seven days a week at 300 or 1200 Baud. Upon signing up with MusicNet, you are given a mailbox from which you can send and receive messages. You can request technical information about keyboards, sequencers, and software; for example, there is a database where all Roland MIDI implementation sheets are entered. There is an annual fee of $75 to access MusicNet ($50 for **EM** subscribers), which entitles you to three free hours on-line. The hourly rate for the use of our service is $5, which is not much compared to other on-line services. We will keep it at this rate as long as possible. (Incidentally, those without modems can obtain a membership plus a Prometheus Pro 1200 Baud modem for $300.) Also, there is a charge of $20 per bank of sounds downloaded. New sounds will be available the first of each month; simply request access to the SynthPatch file area in its message area. You will receive instructions to download in your mailbox. You will only be charged when and if you download. New programs are currently available for the Yamaha DX7/TX and RX11; Roland JX-8P, Juno 106, and TR-707; Casio CZ-series; Ensoniq Mirage (including many free samples); Emulator II (Mac format only); and various other machines. To use SynthPatch, you can purchase the appropriate librarian software from MusicSoft if you don't already have one. We support the C-64, Apple II+ and II/e, IBM PC and compatibles, Commodore Amiga, and the Mac.

There is now an 800 toll-free number for those calling outside of New York State (excluding Alaska). The on-line charge is $17.50 per hour, with a minimum of one hour per month and one free hour of use of the system.

To sign up, dial 914/724-4006 and respond to the various questions. For more info about MusicNet and SynthPatch, call 914/724-3668 or write MusicNet, Box 274, Beekman, New York 12570.

***Jules Delgado** plays guitar and keyboards, and co-manages the Sam Ash White Plains store. He's been playing with computers since the first Apple came out, consults to major musicians on MIDI, and gives lectures and weekly classes in the New York area.*

PAN: Meeting Place for the Industry

BY PERRY LEOPOLD

As the influence of MIDI continues to impact the music industry, the use of computers and modems to store and transmit MIDI data across long distances has become a daily phenomenon on the Performing Arts Network (PAN).

PAN is a computer telecommunications system that serves well over 1,000 professionals throughout the music industry. With over a gigabyte (one billion characters—pronounced jig-a-bite) of storage available, and hundreds of incoming phone lines, PAN's capacity is virtually unlimited. PAN is also international, with access phones in over 60 foreign countries, and is available 24 hours a day, 365 days per year.

Recently, PAN abolished its surcharge on 2400 Baud transmission to bring it in line with its already low rates for 300 and 1200 Baud usage. At 2400 Baud, information can be relayed to and from the PAN Network at speeds of up to eight times faster than normal; this saves a tremendous amount of time and money to Network users.

Members involved with the Synthesizers and MIDI Development special interest groups gain the greatest overall benefit from 2400 Baud operation. For example, a bank of 32 DX7 programs can be transmitted in less than one minute, regardless of whether it is going from New York to Los Angeles, or from London to Tokyo. Even larger sound "samples," which are typically well over 100K (100,000 data bits) in size can be exchanged between terminals in five minutes or less.

I'd also like to point out that I feel PAN's Synthesizer and MIDI Development Network represents the very heart of the international MIDI industry. Indeed, the Network's member directory includes the top names in this field.

On-line "User Groups" have been formally established for users of products from Ensoniq, Kurzweil, Southworth, Mark of the Unicorn, Digidesign, and Opcode (see related stories elsewhere in this issue on how companies use telecommunications). Each of these companies now offers heavily discounted PAN memberships to customers of their specific products and services. The International MIDI Association (IMA) is also based on-line in PAN, as are *Electronic Musician* and *Keyboard* magazines.

In addition, the following companies all maintain active on-line support services and "hotlines" for their customers: Casio, Ensoniq, E-mu Systems, J.L. Cooper, Kurzweil, Oberheim, Roland, and Sequential. Real time conferences are commonplace, and often feature celebrated guest speakers. Recent conferences held included an evening with J.L. Cooper, Roland Night with Jeff Rona and three other Roland product specialists, an evening with Bill Southworth, and an evening with Roger Linn. It is not at all unusual to browse through PAN's Synth and MIDI Forum to find a timely subject, such as "universal file formats," being hotly debated.

In fact, PAN members currently find

Signing on to PAN

If you have a modem and computer, you can sign up for PAN. PAN can be reached by a local call from over 500 U.S. cities and 60 foreign countries, via the Uninet or Tymnet telecommunications services. To sign up, please do the following:

1. Dial your local Uninet or Tymnet access number. For the number in your area, call Uninet at 800/821-5340, or Tymnet at 800/336-0149. You may also dial-in direct to PAN's main computer at 617/576-0862.
2. When you connect, immediately type your terminal identifier: Uninet: (CR).(CR) (that is: RETURN, period, RETURN) Tymnet: Type the letter "A" (without the quotes). Direct: (CR)(CR) (that is: two RETURNs)
3. When prompted for "Service:" or "Please Login:," type: PAN. If calling from overseas, PAN's Host ID is: 312561703093
4. In all cases, at "Username:," type: PANJOIN
5. At "Password:," type: NEWMEMBER

You will then be welcomed to PAN's On-line Signup area, and prompted for all billing information to set up your PAN account.

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Mini-Scissor

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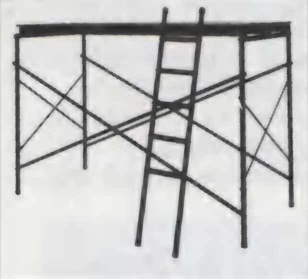
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TR-08	8 SP. (14") TUBE RACK	118.00	83.00
TR-10	10 SP. (17.5") TUBE RACK	124.00	87.00
TR-12	12 SP. (21") TUBE RACK	164.00	115.00
TR-14	14 SP. (24.5") TUBE RACK	172.00	121.00
TR-16	16 SP. (28") TUBE RACK	180.00	126.00
TR-18	18 SP. (31.5") TUBE RACK	190.00	133.00
TR-22	22 SP. (38.5") TUBE RACK	202.00	142.00
TR-27	27 SP. (47.25") TUBE RACK	218.00	153.00
TR-41	41 SP. (71.25") TUBE RACK	268.00	188.00
	KEYBOARD RACKS		
LK-36S	36" LARGE KEYBOARD RACK (INC. 1 TIER)	158.00	111.00
LK-42S	42" LARGE KEYBOARD RACK (INC. 1 TIER)	160.00	112.00
LK-48S	48" LARGE KEYBOARD RACK (INC. 1 TIER)	162.00	114.00
LK-54S	54" LARGE KEYBOARD RACK (INC. 1 TIER)	164.00	115.00
SK-36S	36" SMALL KEYBOARD RACK (INC. 1 TIER)	158.00	111.00
SK-48S	48" SMALL KEYBOARD RACK (INC. 1 TIER)	162.00	114.00
SK-54S	54" SMALL KEYBOARD RACK (INC. 1 TIER)	164.00	115.00
AT-36	36" ADDITIONAL TIER	38.00	27.00
AT-42	42" ADDITIONAL TIER	40.00	28.00
AT-48	48" ADDITIONAL TIER	42.00	30.00
AT-54	54" ADDITIONAL TIER	44.00	31.00
ET-36B	36" ECONOMY TRIPLE RACK (BLK.)	194.00	136.00
ET-42B	42" ECONOMY TRIPLE RACK (BLK.)	206.00	145.00
ET-48B	48" ECONOMY TRIPLE RACK (BLK.)*SPECIAL PRICE!	178.00	125.00
ET-54B	54" ECONOMY TRIPLE RACK (BLK.)	230.00	161.00
ED-36B	36" ECONOMY DOUBLE (BLK.)	174.00	122.00
ED-42B	42" ECONOMY DOUBLE (BLK.)	186.00	131.00
ED-48B	48" ECONOMY DOUBLE (BLK.) *SPECIAL PRICE!	158.00	111.00
ED-54B	54" ECONOMY DOUBLE (BLK.)	210.00	147.00
ER-04	4 SP. EXPANSION RACK-48" WIDTH)	120.00	84.00
ER-08	8 SP. EXPANSION RACK-48" WIDTH)	140.00	98.00
PB-10	PIGGY BACK RACK (TIERS NOT INC.)	30.00	21.00
MS-10	MINI SCISSOR STAND	80.00	56.00
MT-30B	MIC STAND TIER + MIC STAND + MUSIC RACK (BLK.)	60.00	42.00
	X STANDS		
SX-30	SM. X STAND	66.00	47.00
MX-32	MED. X STAND	78.00	55.00
LX-36	LG. X STAND	88.00	62.00
DX-32	DOUBLE X	138.00	97.00
BX-10	BILEVEL X	118.00	83.00
	ACOUSTIC DIVIDERS (GO-BO)		
GB-39	(W39" × H48") GO-BO (BLU, RED, YEL, GREY)	130.00	91.00
GB-52	(W52" × H48") GO-BO (BLU, RED, YEL, GREY)	150.00	105.00
	PORTABLE WORKSTANDS & TABLES		
PW-28	(28 × 18 × 30) PORTABLE WORKSTAND	90.00	63.00
PW-36	(36 × 20 × 30) PORTABLE WORKSTAND	110.00	77.00
PT-28	(28 × 18 × 30) PORTABLE TABLE	140.00	98.00
PT-36	(36 × 20 × 30) PORTABLE TABLE	160.00	112.00
UT-30	SM. UTILITY TABLE	96.00	68.00
UT-36	LG. UTILITY TABLE	116.00	82.00
	DJ STANDS		
DJ-30	SMALL DJ STAND	90.00	63.00
DJ-36	LARGE DJ STAND	110.00	77.00
DB-36	DJ BOOTH (INC. SNAP-ON SKIRT)	500.00	350.00
	RACKING CONSOLES		
RC-10C	RACKING CONSOLE/CASTERS	250.00	175.00
RS-10C	RACKING CONSOLE/SHELF/CASTERS	280.00	196.00
	PARTS		
PCA-10	LOCKING CASTERS (SET OF FOUR)	60.00	42.00
PKA-10	KEYBOARD ARMS (SILVER)	22.00	16.00
PER-10	ECONOMY KEYBOARD ARMS (BLK.)	12.00	9.00
	PORTABLE BIN SCAFFOLDS		
BS-05	(18 × 18 × 60) BIN SCAFFOLD/1.5" DIA. TUBE	124.00	87.00
BS-06	(18 × 18 × 72) BIN SCAFFOLD/1.5" DIA. TUBE	130.00	91.00
BS-15	(22 × 22 × 60) BIN SCAFFOLD/2" DIA. TUBE	180.00	126.00
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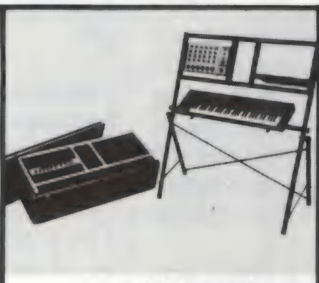
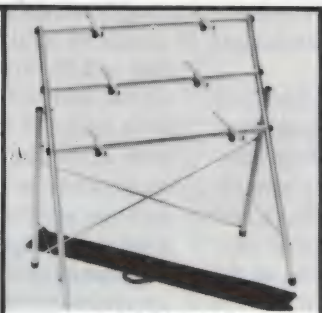
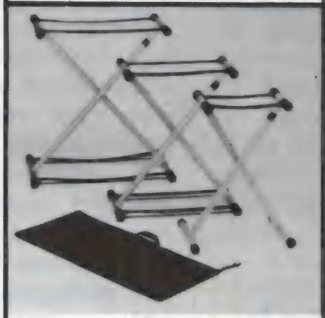

Portable Keyboard Controller Rack

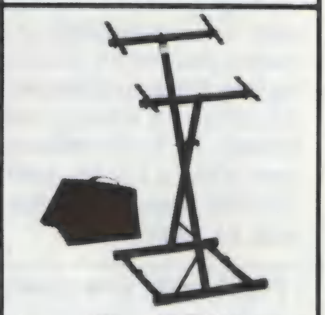

Large Keyboard Rack

Small Keyboard Rack

Double X Stand

With Expansion Tier


X Stands


Bi-level X Stand

Tube Racks

Heavy Duty Studio Rack

Racking Console

Mixing Console Stand

Utility Table

Portable Workstand

Baffle Boards (Gobos)

Speaker Bin Scaffold

Basic Workstation

W/Underdesk Shelf

W/Underdesk and Monitor Shelf

Stereo Rack

themselves in an enviable position, for by making suggestions and discussing issues directly with the very people responsible for much of what is currently on the market, PAN users are able to directly make an impact on the future of MIDI technology. On-line beta-testing and debugging of new products is commonplace, as are advisories and file exchanges of new software revisions.

With over 150 of its 1,000 plus members calling in every day from Japan alone, combined with a multi-megabyte database, PAN has taken a big step towards centralizing the international synth and MIDI community into an "electronic city," accessible from anywhere in the world, and at any time of the day or night.

A special membership sign-up (which costs $150) is required to access this system, plus fees for connect time ranging from $24/hour during business hours to $12/hour for evenings, weekends and holidays. For further information, please contact PAN at 215/489-4640, or write to: The PAN Network, P.O. Box 162, Skippack, PA 19474.

***Perry Leopold** spent several years as a touring singer/songwriter. He started PAN in 1981 and, despite having no previous experience in computers, computerized the network in 1983.*

Synth-Bank: The Ultimate Patch Library

BY BRYAN BELL

Synth-Bank is a software database that includes a public domain library featuring the latest sound files from major keyboard manufacturers, an on-line shopping service where users can purchase specific sound files created by popular artists and programmers, and a third area dedicated to sampling keyboards. This area consists of sounds and sound effects oriented toward production houses and film scoring applications. Although Synth-Bank is designed to be portable to more than one host system, the initial offering will be configured as a complete SIG (special interest group) on the musical network PAN.

Being part of PAN allows for electronic mail between members, conferencing, databases, and the shopping area (to purchase sound patches). For a limited time only, Synth-Bank membership will be available for $50. This includes a PAN membership (a $150 value) to qualified professionals. There will be no Synth-Bank charges (other than normal PAN connect charges) for the downloading of the public domain sound files.

The sound files for the non-sampling keyboards will be stored in Opcode's Patch Librarian format and will be priced roughly at a dollar per sound (i.e. 32 DX7 sounds for $30). The sampling keyboard files will be stored in Sound Designer format and will be based on a sliding scale from $15 to $30. High end synths such as the Fairlight and Synclavier will have sounds stored in their own format and cost anywhere from $30 to $150 (for lenghthier samples.)

I started Synth-Bank to provide a service, and a common meeting ground, to all sides of the music industry. I wanted to help musicians organize and standardize their methods for trading and selling their sounds. I have seen the frustration of many major artists pouring hours and hours into programming a synth when all they needed was a sound slightly better than stock; now they can dial up Synth-Bank and download an acceptable sound within minutes. Another end user will be small production studios that cannot afford to maintain a sound effects library. If they need something specific (even 24 hours a day)—a car crash or a helicopter, they can dial up and download into, say, a stock Mirage. Amateurs who are out of touch with the entertainment industry, and hungry for the latest sounds, are also potential users—as are pro players who are too busy recording and touring to learn how to program different synths from scratch. And of course, manufacturers can use Synth-Bank to distribute their latest sound files and software updates to qualified users.

To join up, contact Bill Hartman in the Los Angeles office (7731 Hollywood Blvd., Hollywood, CA 90046; tel. 213/876-8609) or Bryan Bell on-line (PAN: SYNTH-BANK, IMC: BELL-US, CIS: 76327.3041, The Well: BBELL, MCI: SYNTH-BANK). We will mail you a signup package along with a PAN membership access code. Then simply log onto PAN and send a mail message to the Synth-Bank ID and say "I want to join." We then flag your ID for immediate access into Synth-Bank.

Concerning the future, I believe the real value of telecommunications to the artist is as an archive of important data. It is a hassle to bring all of your backup files on the road with you at all times; it's easier to download your backup files from a host system anywhere in the world—24 hours a day.

However, the single most exciting aspect to me is that telcom opens up the entire global community as a single resource—crossing economic, political, and racial barriers. Before you had to know someone in order to hear their work. Now, via telcom, you can get the best from Australia, Europe, Japan, and North America—all with a local phone call!

***Bryan Bell** is an engineer/producer/programmer who specializes in live sound mixing and high-tech instrument design. Over the last 11 years he has worked with Herbie Hancock, Santana, John McLaughlin, Al DiMeola, and many others.*

Synth-Net and MIDI-Connection: Tech Support for the Working Musician

BY GARY ROTTGER

As someone who has been involved in computers and electronic music since 1980, I've always felt a need for like-minded musicians in this field to exchange information and ideas in this ever-growing MIDI wonderland. This led to my starting Synth-Net, a telecommunications network geared specifically towards electronic musicians.

Synth-Net offers a wealth of information ranging from DX7 patches and Emulator II samples to direct correspondance with Fairlight Instruments in Australia. The sign-up fee is $200, and total connect time costs $16.50 per hour; there are no surcharges for downloading synth patches, samples, or any other type of data.

Synth-Net caters to a clientele of working musicians who use this type of new technology in the recording industry. Anyone using the system with a particular technical problem or question can usually find another Synth-Net member who has had a similar problem and can recommend a solution. However, on-line is not the only place Synth-Net provides technical help to its subscribers. A unique attribute of Synth-Net compared to similar networks is that almost all of the equipment discussed on-line is in use on a daily basis in Synth-Net's own pre-production room; a Synth-Net staff member is literally able to walk into the next room to research a detailed question about a certain keyboard or computer.

The ability to answer technical questions is only one aspect of what telecommunications can do for users; another story in this issue mentions how the rock group Honeymoon Suite came to Synth-Net for help after the truck carrying all of their equipment was stolen out of a parking lot. Other services available to subscribers include electronic mail, on-line shopping, forums with manufacturers of music-related technology, and access to services such as airline guides, Dow Jones reports, and various news wires. For more information on Synth-Net, call 212/564-1776.

Synth-Net is a high-level type of service. However, I'm also running a free MIDI BBS called the MIDI-Connection. It offers a little bit of everything and is mainly used as a message base for electronic musicians in the East Coast's tri-state area. MIDI-Connection is open to anyone regardless of location, but remember that calling from outside of New York City will result in a toll call. The data line is 212/594-2646.

***Gary Rottger** is a New York-based producer and synth player who works with artists such as the Fat Boys, Blow Monkeys, and Kenny Kirkland.*

Cruising the Boards: One User's Experiences

BY JACK ORMAN

Computers and music . . . a marriage that was inevitable. But there is an offering in the wings that has not yet blossomed to its fullest, and that is music, computers and the telephone. In the business of music as in any other modern business, information is money, and easy access to that information is what counts.

The introduction of inexpensive modems has brought communicating over the phone line into the reach of most computer owners. Not surprisingly, there are quite a few on-line services that are geared towards musicians, totally or as a part of their services.

I spend a lot of time on PAN, but it's worth noting that PAN members can also access the Delphi network at no extra charge (however, Delphi members cannot cross over to the PAN system). Delphi's Music City SIG is devoted to music-related topics with areas of special focus on synths, audio, video and film, performing and more. An on-line shopping service is even provided through which products from different vendors are available.

Contact List

CompuServe: 800/848-8199 (voice)
Delphi: 800/544-4005 (voice)
GEnie: 800/638-8369 (voice)
Hybrid Arts: 213/826-4288 (computer)
Madisound BBS: 608/767-2673 (computer)
MIDI-BBS: 604/263-8487 (computer)
Musician's Exchange: 619/462-5229 (computer)
SNAPP MIDI Board: 714/921-2255 (computer)
The Source: 800/336-3330 (computer)
Synergy BBS: 415/961-3811 (voice)

The forum areas of the group allow open messages to be posted for all to see, comment on, or offer assistance in reply. An electronic mail section is available for private messages from user to user. Delphi is oriented more for the amateur musician or audiophile while PAN is slanted towards the professionals. The lower rates for Delphi service make it especially attractive.

The other commercial services, The Source, CompuServe, GEnie, the Well and others, have similar functions for mail, messages and even music-related SIGs. No long distance charges are involved in most cases since special telephone networks are available that allow you to call a local number and get in direct contact with the services. Most large cities have at least one of these phone systems with Uninet, Tymnet, and Telenet being the most widely used. In most cases, the cost of the local phone network is covered by your on-line charges with the computer host.

Of the manufacturers' Bulletin Board Systems that are available, I have tried the Hybrid Arts offering and found it interesting and the systems operators very helpful. Of course they strongly support their own software and services, but that doesn't detract from the enjoyment of this BBS.

The privately owned and operated BBSs come and go with alarming rapidity. Several of the numbers that I had for private music-related systems had to be deleted since I tried to access most of them right before the article deadline, and found that their phones had been disconnected. A few are still operating and I have included the numbers with this article.

Once you've made the decision to try telecomputing, the next step is to get a modem and telecommunications software to go with your computer. Try to find the number of a local BBS and access it in order to familiarize yourself with the software and telecomputing basics. *Computer Shopper* magazine publishes extensive lists of private BBSs monthly. Once you've become accustomed to the art of telecommunicating, then progress on to long distance calls or the commercial services; you'll save a lot of money by following this advice.

The accompanying table lists some phone numbers to get you started in this new and exciting means of adding to your musical experience. I hope that this article stimulates some of our readers to give it a try, and I look forward to meeting you in the forums and SIGs. You can reach me on PAN via user name JAO.

When not writing for Electronic Musician, ***Jack Orman** is busy developing new MIDI products for Armada Sound Lab (Box 858, Southaven, MS 38671) or writing songs for his hard-rock Christian music band.*

Coping with the Information Explosion

BY CRAIG ANDERTON

Yes, it's a marvelous high-tech world we've gotten ourselves into . . . with downloadable patches, messages, electronic mail, and so on. In fact, the main problem with telecommunications is that there is *too* much out there—you could easily spend every minute of your waking life "cruising the boards" and still not be able to digest everything.

This is to a degree a major problem in our information-oriented society: how do you separate the information you truly need from information that is either frivolous or non-applicable? When one signs on to a BBS and finds there are over 3,500 messages, it's hard to know where to begin. And unless your modem is operating at 1200 or 2400 Baud, just scanning those messages to see if any are of interest could take hours.

Another problem is the expense of telecommunications. Each system has its own operating system, and unique set of codes and commands. To log off one system, you might type EXIT; for another, QUIT; and for another, GOODBYE or BYE. If you subscribe to more than one service, as I do, it's hard to keep all this straight. Although help messages are usually available on-line, it is very time-consuming (and remember, those connect time charges really do add up) to access these; although PAN provides good hard-copy documentation, other networks are not as meticulous. In fact, the only way I really found out how to make best use of Esi was through an excellent, though costly, book written by an independent consultant (however, having that book saved me much money in the long run). Learning a system is like working with an elaborate software program, and the learning process takes a considerable amount of time and money. Add that to the sign-up fees, equipment cost, and so on, and you're talking about a *minimum* of $50 a month for the privilege of telecommunicating (which doesn't include additional expenses on your phone bill if services like Uninet and Tymnet are not a local call, which is the story in my case).

Sometimes the operating systems can be quirky. For example, PAN "remembers" all back spaces so if a lousy typist sends you a message on-line and hits backspace a lot to correct errors, your text will be sprinkled with control characters if you upload or download between machines. Also, with most systems, the more users there are on the system, the more it slows down. Of course, one should ideally use non-prime (i.e. evening and weekend) time, but that's not always convenient. And no system is perfect; although Esi has one of the cleanest operating systems around, it still suffers from occasional bugs and down time, as do the "host" computers under which most music networks run.

A final problem is that the membership of these networks is not all that big, and often the same names keep popping up on the different nets. However, as more musicians sign up with different services, I assume these services will gravitate towards specific niches and markets. Certainly the situation is better than it was a few years ago—hardly a day seems to go by without my hearing of some friend or acquaintance who has gone on-line, and there are certainly enough telecommunicating musicians to more than justify the networks' existences.

So telecommunications can be expensive and time-consuming. Is that enough of a problem that I don't take full advantage of these systems? Yes. I would love to spend more time "cruising the boards," but time and money get in the way. Is this enough of a problem that I would give up telecommunications? No way!! I keep in touch with authors and receive articles via e-mail, check stories for accuracy, and find the bulletin boards—while perhaps a bit overrated in general—to be *invaluable* on occasion. I would suggest following Jack Orman's advice about getting started on a local, free bulletin board. Only then is it time to spend some bucks and move up to one of the more pro-oriented boards. Carefully consider your needs, and sign up with the service or services most suited to your application.

For the casual musician, telecommunications is probably a luxury. But if you are professionally involved in musical electronics on any level, either as a player, manufacturer, producer, service tech, or whatever—or even if you are a dedicated hobbyist with some disposable income—I would *definitely* recommend signing up and getting on-line. It's the best way to keep in touch with a fast-paced and fast-moving industry.

***Craig Anderton** is on the board of Governors of the San Francisco chapter of NARAS, and plays guitar and keyboards in the synth-rock group* Transmitter.

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What good is telecommunications? We asked several people and companies who are ultra-active on-line for their comments.

Telecommunications in the Real World

Life on Esi Street

BY LARRY FAST

I was one of the first people to sign up for the IMC system (now Esi) in 1983. The potential advantages of the system were obvious then, but there was some question in my mind as to how tools of the computer world would fare in the music business. As it turned out, us early tech-freaks created quite a monster by teaching a group of highly creative and dynamic people how to use their new personal computers. I am convinced that the proliferation of computer-based MIDI music systems and the computer-based e-mail have reinforced each other's acceptance.

I use Esi primarily for e-mail, although I do make occasional use of the professional trade magazines' charts and news services. Likewise with the bulletin board system (BBS); when I have needed information, I have always gotten valuable answers back. The somewhat exclusive nature of the network has made it a useable tool, free from the well-meaning, but time-consuming "fan mail" that I have run into elsewhere. And the pro-audio, executive-level music industry, and strong overseas membership suit my purposes better than a more general musicians' network for now.

WHERE'S MY PHONE ?

Larry Fast's Dilemma

MATT McCULLAR

E-mail has served every purpose for me: from people booking me for record dates to me booking studio time; social contacts; expediting long-distance overdubs at a remote studio location from the main recording; maintaining personal contacts with distant friends; Telex communication for record companies without e-mail; and even receiving birth announcements and sending letters of condolence. The obvious advantages of e-mail over phone calls are those of time-zone crossing and not even having to know where your recipient is.

The only down side that I have experienced is a very inefficient and disorganized billing structure within Dialcom. This has led to some mystery bills and some undeserved dunning notices. And, in truth, I still don't quite understand how the bills are calculated. In all fairness though, Esi is aware of the problem and I have been assured that measures are being taken to reorganize the billing department, especially now that Dialcom has been purchased by British Telecom.

Having recently completed projects with John Oates and Peter Gabriel, synthesist ***Larry Fast*** *is hard at work on his latest Synergy album. His first two Synergy albums,* Electronic Realizations for Rock Orchestra, *and* Chords *were recently released on CD.*

Making the World Smaller

BY GRAHAM NASH

My world changed for the better when I got acquainted with the electronic mail system. Being able to communicate with so many people, all of whom seem to be in my "industry," is a great advantage. The world is growing smaller every day and e-mail is helping to reduce the distance between people. So many of my friends have told me that most of the work that they have been doing started as a direct result of using the electronic mail system. The list of subscribers is endless, as anyone who's tried to download the "members" list will tell you. They include artists, managers, directors, camera-men and women, producers, lighting directors, road managers, engineers, publishers, accountants, and a whole army of people involved on a day-to-day basis with the entertainment industry on all its levels. Personally, I use e-mail to send ideas to friends for comments and suggestions, no matter where they are on the planet. I know people who write songs together via e-mail, and people who play chess via the system. The possibilities are endless. My advice is to check it out and start using the great technology that is becoming more and more available to us as we move into the future.

Graham Nash*, from his early days with the Hollies to his work with Crosby, Stills and Nash, has been acclaimed as one of the most expressive vocalists and literate songwriters in popular music.*

The Studio Manager's Assistant

BY GRAHAM HUTCHEON

About three years ago, we were given a demonstration of electronic mail by IMC. The first question we asked was "Who else uses the system?" At the time, not too many other people were using it, but we figured it was going to be like the birth of the telephone system: it could only be useful if people were connected, so we took the plunge in an act of faith and joined. I then spent the next six months saying to everyone "Why aren't you on e-mail?" Joining was a good move, because now just about everyone in the music business is connected.

I run Farmyard Studio and, because we are one of the best equipped studios in Britain and also provide luxurious living accommodations for the artists working here, we get a lot of bookings from acts from the U.S., Canada, Europe and Australia (as well as plenty of home-grown talent too). Before e-mail, because of the time differences between these countries, the communications problems dealing with record companies and management were nightmarish. Los Angeles is eight hours behind England: perfect—a working day! I used to spend a lot of time and money phoning L.A. from home in the evenings, but now that problem just doesn't exist. If a band's on the road and I'm organizing a booking with their manager, I no longer need an out-of-date itinerary which has all the wrong hotels listed to try and time the phone call to coincide with breakfast in Seattle—I just bang a message off to his e-mail box and he can read it wherever he is, whenever he likes. This is all pretty obvious stuff, but it's invaluable.

> *"I think a new style of communication is developing in parallel with the technological innovation"*

That's the business side, but along with the wacky world of rock and roll, my other obsession is computers and computing. Therefore, I'm also a user of BIX which is *Byte* Magazine's electronic conferencing forum, the Byte Information Xchange. (You spell things funny over there in the U.S.) Again, this is only as good as the people who use it and I find it a remarkable tool. It runs on a computer in New England, but I get access via satellite . . . just one local phone call in England, and I find myself immediately in the middle of a live conference, most of the members of which are professional software and hardware developers working on various machines. I have an Atari 1040ST at home and the tips and shortcuts I've picked up about programming it—a lot of which have just been discovered by conference members (Bixen as we're known) who are happy to share the knowledge even with their competitors—would fill a book. If you're stuck trying to do something that you can't get to work, you can leave a message asking how to do it; there's almost always someone who has the answer. Most problems are solved within an hour! I use BIX a lot.

What has been surprising is the syntax of the messages on both systems. They aren't written like letters and they're not cost-consciously stilted like telexes. They are somewhere halfway between a message left on a telephone answering machine and a letter. I'm sure no one's done a study of it, but I think a new style of communication is developing in parallel with the technological innovation. It will be interesting to see how it turns out in years to come.

I've also noticed that while people don't always return your telephone calls, they invariably do reply to e-mail. I think this has something to do with the immediacy of the medium coupled with the still slightly distancing effect using a typewriter-style keyboard.

One thing's for sure, though—I'm glad we took the plunge when we did. Now every morning I read the "analog" mail (that's the stuff the postman brings) and then check my electronic messages on e-mail. I often wonder whether the people who send me messages from around the world would have bothered getting in touch if I wasn't on-line.

***Graham Hutcheon** is the studio manager at Farmyard Studio, a residential recording studio in Buckinghamshire in England.*

Customer Support: E-mu

BY MARIE "FIFI" BRAYMAN

E-mu has actively been on PAN and IMC (Esi) since February '86. We had subscribed before that, but it wasn't until my boss Kevin Monahan showed me how to log on that we were on every day. I was hooked immediately! Now the first thing I do in the morning is check both networks for mail, as well as PAN's Forum and Synth SIG. I save it all then run upstairs and print it out. I then give copies of letters directed to specific people to those people, and a copy of service questions to a technician. If the mail concerns new sounds or general information, I'll answer and supplement with literature, instructions, or schematics in the "real" mail. With the Forum and SIG messages, I make copies and give them to the sales people so that they know about the latest rumors and such.

We also use the bulletin boards on PAN and Synth-Net to post information concerning software updates and new products, but probably the most helpful applications I've seen for electronic mail is for touring bands who need immediate parts sent or service questions answered. Because of time differences and problems with accessing phones, this method of communication is wonderful!

***Marie "Fifi" Brayman** is the Sound Librarian at E-mu. Prior to joining E-mu, she worked in live theater for six years; she loves chocolate and has been studying still photography for two years.*

Telecommunications for the Touring Professional

BY TONY LEVIN

Lately I find e-mail indispensible. The critical need comes from the fact that I work with more than one group. How else could I have been out on tour with King Crimson and from my hotel room in, say, Avignon confirm the latest plan changes for an upcoming Peter Gabriel tour with his England-based management? Travel changes are also a breeze when your travel agent uses e-mail. I just get on-line late at night, write in my need for a flight change, and, hopefully, it will be confirmed by the time I get up.

Since I bought my portable Radio Shack Model 100 a few years ago, I've seen the system I use grow from 39 users to thousands. In the old days, it was a bit lonely on the system . . . a lot of jokes and fun messages were traded among the few friends I had on-line. Now, with most of the rock industry on that same system, I not only get itinerary changes and travel plans on-line, but also calls for sessions and future tours.

I'd say the most ideal use of e-mail for me was the booking of an album I did for Larry Gowen, a Canadian singer. David Tickle (the producer), Jerry Marotta (the drummer), and I were all working on different projects which took us all over the world, yet we kept looking for a few free weeks in the same continent. Finally, after four months, we got lucky and did the album. Without computers, I doubt if we could have even found each other by phone even once, let alone had the daily dialog we needed.

At home I don't use the music industry e-mail system as much, but I still find myself on-line a lot, this time doing home banking with my Macintosh. That saves me a lot of hassles, and I think this will be a great use of everyone's computer in the future. For myself, when I have some free time, I hope to hook into a musician's system for music software info. There I

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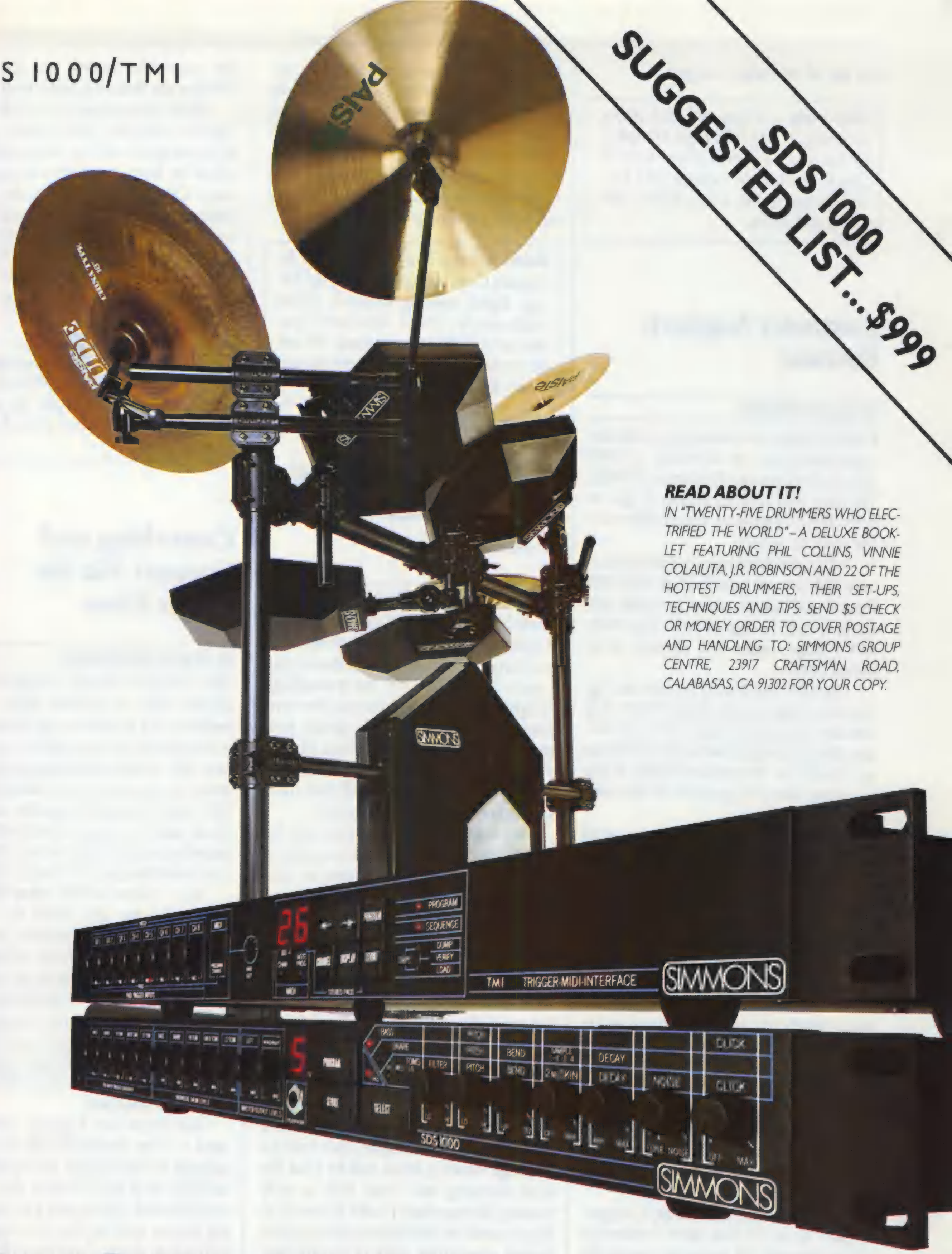
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can use all the help I can get!

__Tony Levin__ is a bass and Stick player, currently on tour with Peter Frampton. He has also recorded or played live with King Crimson, Peter Gabriel, John Lennon, James Taylor, Carly Simon, Dire Straits and others.

Customer Support: Ensoniq

BY ROBIN WEBER

Ensoniq began its involvement with telecommunications in the winter of 1986 with the Performance Arts Network (PAN). We have also recently begun to get involved with Synth-Net, which offers similar services to PAN.

When we first began our association with PAN, we ran a promotion with PAN that offered free membership on the network to new Mirage owners. Currently, new Mirage owners are entitled to reduced rates.

Once on-line, Mirage owners can register in a sign-up area from which they can key in questions directly to our factory. Questions are downloaded each day and routed to the proper people in the company. We then get back on-line with our responses.

For example, a group of musicians was going to tour England and wanted to know where they could hire Mirages once they arrived. We telexed our European office for the information, and relayed it back to the musicians by uploading it on PAN.

We average about ten direct questions on products each week. We also post the most commonly asked questions in the Forum area of PAN, which is an open area of communication for on-line users.

In addition to using PAN to send and receive electronic mail, we use the Database section of the network to post spec sheet information on new products, MIDI implementations, and software update information.

Twice a month, on Tuesdays, we participate in an on-line users conference where, through our computer and all the other computers on-line with PAN, we can all tie-in and talk to each other through a moderated system.

There are other areas on the network where Mirage and ESQ users have developed their own on-line information exchange—for example, sample and sound swaps. From a corporate level, we communicate through the network directly with our advertising agency, the Transoniq Hacker newsletter, magazines such as **EM**, and software developers. We also can post press releases and exchange ad copy with our agency. All in all, e-mail has been a real help to the company.

***Robin Weber** is Marketing Director for Ensoniq Corp., manufacturers of the Mirage digital sampling keyboard, Digital multi-sampler, ESQ-1 digital wave synthesizer and the Ensoniq piano. He can be reached on the PAN network via user name: ENSONIQRLW.*

Connecting the Studio and the Road Via E-mail

BY PHIL MANZANERA

I first became aware of the existence of e-mail whilst recording with Tony Levin and Jerry Marotta at the Townhouse Studios in November 1984. But it was Hugh Padgham, who was also there at the same time doing the Phil Collins album, who gave me the push to get involved. Having a recording studio as well as being a touring musician, it seemed that there was a dual role for e-mail for me.

We have two e-mail boxes, one for Gallery Studio which is used for ordering rental equipment, contacting me on tour, and locating session musicians amongst other things. In fact, it was through e-mail that we arranged to use Tony Levin in the first place, as we had no telephone number—only his e-mail number. We were in England, and Tony in the U.S., but we had our answer in a few hours.

I use e-mail as a means of communication to and from my studio, but also it is very useful on tour for contacting my manager. It is often difficult to reach him—especially if you need information at 2 a.m. in Rome, for example—but I send a message which I know will be read the next morning and I can have a reply waiting for me when I wake up the next day. It could be information about dates, record companies, state of record play, and so on. It's also great for locating people with whom you have lost contact in the music business. I once used e-mail to communicate with an Australian record company regarding non-payment of royalties; it saved telephoning and finding that they were "at a meeting"! Also, with this particular system you can know whether the letter has been read or not.

I keep my addresses on a Radio Shack (Tandy) computer, and recently on tour all the memory was lost, so I e-mailed the whole lot from the studio's computer to mine. On another occasion, the reverse happened when the studio's address file was erased: we e-mailed the file from my Tandy computer to home base. This was a godsend as the data took years to compile; where would I have been without e-mail?

*Electronic guitarist **Phil Manzanera** is a highly-respected musician for his pioneering work with Roxy Music, his solo albums, and his session work with major rock artists.*

Consulting and Support Via the Phone Lines

BY DAVID SCHEIRMAN

The concept of e-mail is a good one for anyone who is involved with creative projects on a national scale, because one is not limited to the regular 9-to-5 business day as with telephone communications, or to a wait of several days for the U.S. mail. For me, being able to stay in touch and to convey information from anywhere in the world, around the clock, is an essential part of doing business.

As a concert sound mixer who's on the road a lot, I've found the TRS-80 Model 100 portable computer, and similar "notebook computers" with built-in telecommunications modems, are easy to use. I carry a Brother M-1009 printer as well. A mini-toolkit with screwdrivers, phone jack adapters, and a set of acoustic couplers makes it all very easy...the entire setup fits in a Zero Halliburton aluminum briefcase.

Accidents can happen, however. I used to carry the Model 100 as carry-on baggage in soft luggage, but a stewardess stepped on it and cracked the internal circuit board. I now carry a small soldering iron as well; but the 100 is basically a sturdy little thing if well cared for.

Since I'm currently working as the house sound mixer for Jimmy Buffett on a nationwide concert tour, I use telecommunications almost daily. I'm also advising the audio equipment manufacturers with whom I deal to join the growing group of musicians, sound engineers, and

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David Abramowitz & Ralph Talbott, KEYBOARDS, COMPUTERS & SOFTWARE, June/86.

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Rick Davies, MUSIC TECHNOLOGY, July/86.

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auditorium managers who use this technology for communications as it really helps speed up user feedback. Currently, I am field-testing the new TAC mixing consoles, manufactured by Amek in England. We use electronic mail for exchanging user comments with the console manufacturer, and for technical support.

For those persons who still doubt the value of computer telecommunications and electronic mail to the audio and music industry professional, please note that this text was posted from a hotel room in Atlanta, Georgia at 3 a.m. EST; it was in Craig Anderton's electronic mailbox within three minutes, awaiting regular business hours. No typewriters or postage stamps, thank you very much.

***David Scheirman** is a live sound mixer and concert sound consultant who lives in San Diego county. A former professional musician (electric and acoustic bass), he keeps in touch with friends, clients and business associates through electronic mail on a regular basis.*

The Modem as Back-Up

BY BOBBY NATHAN

One of the best ways to use a computer modem is to store back-ups of your synthesizer patches to a computer access network. If you do studio work and move your gear around a lot, this is a must. One of the more interesting things that happened to us recently was helping Canadian group Honeymoon Suite out during a most difficult situation. Honeymoon Suite had been touring America as the opening act for Heart. Before setting up at New Jersey's Meadowlands Arena, their truck with all their gear was stolen. Although we could help find someone local to rent new gear, the real problem was that their back-up patches were gone as well. Luckily, a duplicate set of patches was available via Esi. Our keyboard maintenance tech, Marty Strauss, assisted the group in downloading their patches via Macintosh computer and modem.

The process of saving patches via phone is interesting. First, the patches were converted to Opcode's "Patch Librarian" software format. Next, patches were uploaded using another Macintosh software product entitled "Red Ryder." Red Ryder can transfer binary files with complete error checking (a process that compares what was received with what was sent). Downloading the patches required a Macintosh computer, modem, Red Ryder software, Opcode's software, the local access telephone number for Esi (the host service for Synth-Net), and Honeymoon Suite's log-on password.

Another great application is that two or more songwriters using the same computer and sequencer software package can collaborate across town or even across country. If there could be a standard MIDI sequencer data storage format, then data could be transferred from one type of sequencer into another via data exchange—not just in real time.

It would be nice at some point if manufacturers had 24 hour access numbers set up so that owners of their products could call in and download factory patches. You would be required to give your name, model number, and serial number to gain access. Also new patches could be purchased via MasterCard or Visa. Remember, in the future, anything goes!

***Bobby Nathan** is co-owner of Unique Recording Studios, Inc. in New York City; he consults to Yamaha International, E-mu Systems, Roland USA, Korg USA, Akai, and Fairlight USA.*

The Modem Meets the Scribes

BY BENJAMIN KREPACK

When we first set out to write the book *Start Me Up* (about musical uses of computers), my co-author and I agreed that we would attempt to utilize as much of the new technology as possible. As the book progressed, the thought of writing anything without a word processor was scary enough, but we soon discovered that telecommunications ran a close second in technological value. One of the first things we did was join up on networks geared toward the music industry. Esi was first, and then we discovered the Performance Artist Network, better known as PAN. Joining these networks enabled us to request interviews by either posting notices on the networks' bulletin boards or by sending messages to specific individuals via their electronic mailbox. This was a lot more efficient than calling on the phone to leave messages with secretaries or phone machines explaining the concept of the book and what we wanted to talk to them about. A few of the interviews were conducted completely on-line, which had the advantage of letting us send out specific questions and then receive well thought-out written answers. This saved us money on long distance phone bills (one of our interviewees was based in London) and, once we received the answers, we didn't have to transcribe anything—it was all right there to download onto disk and start incorporating into the text.

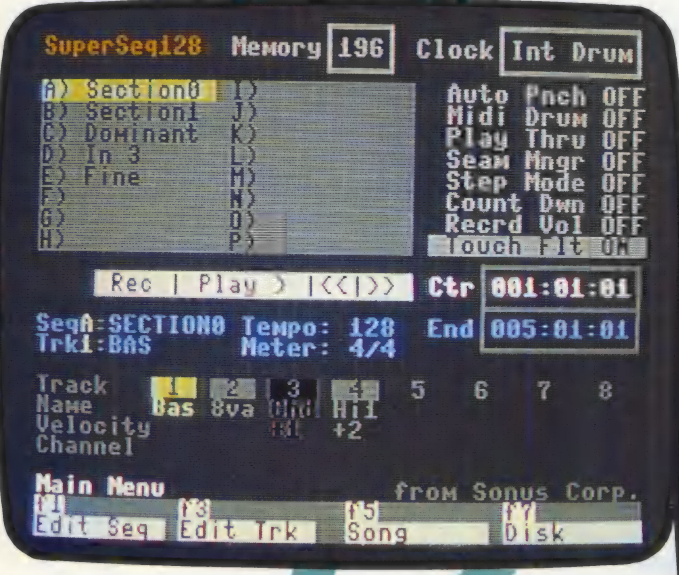
After completing the book's first draft, we used telecommunications to verify quotes for correct name spellings, business titles, and technical accuracy, as well as to receive any comments. As authors, we also used our modems for communication between each other. We only live about ten miles apart, but having the ability to show your partner a draft of a chapter within seconds and still be sitting at your own computer proved to be quite a luxury.

How guitarist Joe Walsh wrote the foreword for "Start Me Up" is probably the best example of how telecommunications played such an integral role in the writing of our book. Esi president Don Singleton told us Walsh was a heavy e-mail user and suggested we speak to him. But Singleton strongly recommended that rather than just send Walsh a message on the system, we go through the normal channels of requesting an interview with a big star. So, we did. We placed many calls to Walsh's management company and when someone finally returned our call, they suggested a formal written request be sent in the mail. We did that, and got no response. Then we called his record company and went through the same series of unreturned phone calls and unanswered letters. After a couple of months of this classic music business scenario, we decided we had absolutely nothing to lose by sending a polite, concise note directly to Walsh. In less than 24 hours, Walsh had checked out our credibility with Singleton and wrote back saying he was interested in our project and would like to be interviewed when he had the time.

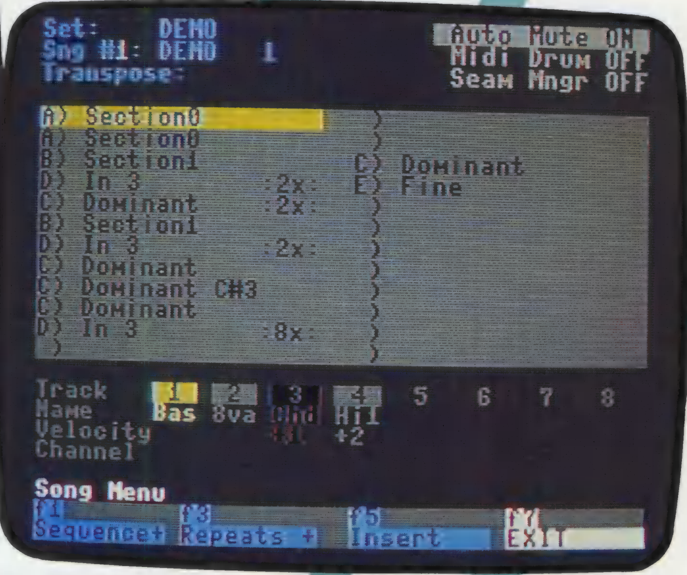
Unfortunately, we caught him just as he was putting a new band together and planning a tour, so he warned us that it might be a while. What followed was a series of electronic conversations with Walsh spanning an eight month period. We kept him informed on the book's progress and he kept promising an interview. He was encouraging, funny, gracious, and very difficult to pin down for a

—page 70

ADVANCED MIDI SOFTWARE



```
SuperSeq128  Memory 196  Clock Int Drum

A) Section0   I)              Auto  Pnch OFF
B) Section1   J)              Midi  Drum OFF
C) Dominant   K)              Play  Thru OFF
D) In 3       L)              Seam  Mngr OFF
E) Fine       M)              Step  Mode OFF
F)            N)              Count Dwn  OFF
G)            O)              Recrd Vol  OFF
H)            P)              Touch Flt  ON

   Rec | Play > |<<|>>        Ctr 001:01:01

SeqA:SECTION0 Tempo: 128      End 005:01:01
Trk1:BAS      Meter: 4/4

Track     1   2   3    4   5   6   7   8
Name     Bas 8va Mid  Hi1
Velocity     [illegible] +2
Channel

Main Menu                from Sonus Corp.
f1          f3          f5         f7
Edit Seq    Edit Trk    Song       Disk
```



```
Set:    DEMO                  Auto Mute ON
Sng #1: DEMO   1              Midi Drum OFF
Transpose:                    Seam Mngr OFF

A) Section0               )
A) Section0               )
B) Section1               C) Dominant
D) In 3          :2x:     E) Fine
C) Dominant      :2x:     )
B) Section1               )
D) In 3          :2x:     )
C) Dominant               )
C) Dominant C#3           )
C) Dominant               )
D) In 3          :8x:     )
 )                        )

Track     1   2   3    4   5   6   7   8
Name     Bas 8va Mid  Hi1
Velocity     [illegible] +2
Channel

Song Menu
f1          f3          f5         f7
Sequence+   Repeats +   Insert     EXIT
```

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Want to get online, but thought you couldn't afford the hardware and software? Surprise!

Budget Modems

BY ALAN GARY CAMPBELL

If you're the proud owner of a personal computer, and an **EM** reader, chances are you've considered using a modem to allow your computer to communicate with numerous BBSs (Bulletin Board Systems), SIGs (Special Interest Groups), and online catalogs dedicated to musical interests. Let's face it, we're in the middle of an information *revolution,* with electronic music determined to take up at least its share of info space. Electronic musicians are already using their computers online to communicate via electronic mail ("e-mail"), buy and sell equipment, and even exchange patch and sequence data.

Purchasing a modem used to be an expensive proposition—but not any more. Microelectronics has reduced the functions of complex analog modem circuits to a single digital IC, so you don't have to spend a lot to get real telecommunications power.

Most inexpensive modems are designed to work with inexpensive computers, or computers that have been around for a while (Commodore 64, Apple II, TRS-80, and IBM PC). So, you'll probably have more success finding a good buy on modems for these computers. Regardless of which modem you choose, shopping for it is a lot like shopping for anything else: if you catch a sale, rebate offer, or close-out deal you'll pay less. But before you shop, you need to determine what features you require, and just how you'll go about attaching the modem to your system.

MODEM HARDWARE

Low-end modems are generally *300 Baud, frequency-shift-keying* types (see sidebar). Hackers will tell you that 1200 Baud is better which, in terms of speed and utilization of bandwidth, it is—heavy users couldn't stand the phone bills at lower Baud rates. But, for the rest of us, 300 Baud is sufficient. Most independent BBSs are budget operations that are limited to 300 Baud, anyway; and all the "big boys" can also transceive at the lower Baud rate, so you *can* communicate. Also, data errors are less of a problem at 300 Baud, and some networks charge you more for 1200 Baud access.

Most budget modems use single-IC "modems on a chip," like the Texas Instruments TMS99532. The actual telecom functions you get are determined by the *software*; what appears to be a "dumb" modem (i.e. no automatic features such as auto-dialing, auto-answer, or saving files once they've been downloaded) may have hidden powers that can be awakened by a more sophisticated telecommunications program. The principle is the same as computers—no matter how powerful the hardware, it won't do anything interesting or useful without some software. Modems with auto-dial and auto-answer features are useful, but not absolutely necessary.

Modem designs include: cartridge-like modules that plug into game ports or other connectors; self-contained boards that plug into internal slots; or external peripherals that connect to an RS-232 interface.

For computers like the C-64, with only a single expansion bus or cartridge port, the modem clearly has to plug in there. This can be inconvenient if the port is already occupied by a printer card, MIDI interface, or the like. However, you could purchase a switcher or bus-expander or, for occasional use, simply unplug the cards. These modems draw power from the host computer, eliminating the need for an external power supply, and have standard modular phone jacks for the phone line connections.

> *". . . heavy users couldn't stand the phone bills at lower Baud rates"*

For Apple IIs and IBM PCs, the modem is typically a card that plugs into an empty slot in the computer, or a peripheral that attaches to an already installed RS-232 card. Internal modem cards draw power from the computer, and usually incorporate standard modular phone jacks on a cable or have jacks affixed to a plate that mounts on the computer's rear apron. Internal modems have the advantage of being entirely self-contained, thus eliminating incompatibility problems that can occur with an external modem and RS-232 card. However, internal modems have a nasty habit of only working with the software that comes with them, and these days you can buy an RS-232 card *and* external modem for about the same price.

External modems connect to an RS-232 (serial) card, usually via a ribbon cable and DB25 connector; avoid types that require some special cable that can cost more than the modem itself! Also, be

What's a Baud?

The Baud is a unit of *rate of information transfer,* and was named after Baudot, the inventor of the first teletype code. The Baud rate specifies how many bits are transferred in one second; typical Baud rates are 300, 1200, and 2400 Baud (bits per second), although some modem services go to 9600 Baud or even higher. You can determine the approximate number of characters transferred in one second by dividing the Baud rate by ten—for example, at 300 Baud approximately 30 characters are transferred every second, and at 1200 Baud, approximately 120 characters.

Since computer data cannot be sent directly down the phone lines, it is first converted into audio tones that can pass through the phone system. The principle is similar to the cassette interfaces found on most synthesizers, which convert synthesizer data into audio tones suitable for storing on tape. To differentiate between ones and zeros, the audio tone will shift between two frequencies—hence the term, Frequency Shift Keying.

__Alan Gary Campbell__ is owner of Musitech™, an electronic music consulting firm. Musitech is highly involved in electronic music service and modifications, and has been cited by Moog Electronics, Inc. as one of its top ten authorized service centers worldwide. Campbell is also a synthesist and technical writer.

sure that the modem is compatible with your RS-232 card, as some will only work with one or two specific serial cards or clones. External modems are usually powered by an AC adapter, and have modular phone jacks built-in. An external modem can be your best investment, since with a switcher you can use the serial card with other peripherals. In fact, if you have a serial card installed and all the other slots are full, then you'll have to use an external modem, or remove an existing card.

HAYES-COMPATIBILITY

Hayes is a major manufacturer of modems—so much so that their software parameters have become a sort of de facto standard. A Hayes-compatible modem will work with a large selection of available telecommunications software. Other factors being equal, I feel a Hayes-compatible modem is a better buy.

MODEM SOFTWARE

Most modems come "bundled" (i.e., they include) telecommunications software. Ideally, you'd want to get a deal on a good modem with great software, but you might get a great modem with lousy software, or any of a number of possible permutations. You'll often find what are apparently surplus modems that include no software. The big question here is software compatibility: the description may say "Hayes-compatible," but is it? Modem software by itself can be pretty expensive, but check your BBS: there are public-domain telecommunications programs that you can download for free—the catch is that you have to already have a modem and software! Maybe you can temporarily borrow software from a friend.

Software features and user-friendliness are *critical* to getting the most from your modem. At the very least, you'll want the capability to send (upload) files, receive (download/capture) files, edit files, and have your computer emulate a "dumb" terminal. The communications parameters should be fully adjustable, including the number of data bits in a word (7 or 8), parity (odd/even/none), number of stop bits (1 or 2), duplex (half/full), and mode (originate/answer). Some software offers a dizzying array of programmable parameters that you not only can set but that you *must* set. Still, it's probably better to be totally confused for a few weeks than to not have the features you need later.

A few "gee whiz" features can make using a modem a lot more fun: many telecom programs incorporate *macros*—sub-programs that let you access services such as Compuserve automatically. Some have *auto-save* and *auto-load* functions that "hand-off" files to a disk drive, allowing you to send and receive files that are too big for the computer's RAM space. Better programs have unattended/remote operation, allowing you, or anyone with the correct password, to call your computer and log on automatically.

Prospective **EM** authors should be aware of one software problem: many telecom programs will embed unwanted carriage returns at the end of each formatted line of text. This function is implemented so as not to confuse dumb terminals and teleprinters (in other words, dinosaurs that nobody uses). This is a real pain for the person receiving the file; before the file can be edited and reformatted, the superfluous carriage returns have to be taken out. Good software doesn't do this.

COMPUTERS WITH BUILT-IN MODEMS

Some lap computers, like the Radio Shack TRS-80 Model 100, have built-in modems with telecommuncations software in ROM. Prices on such units are falling all the time, as new technology supplants them. For example: some Radio Shack stores recently blew out the remaining 8K Model 100s for under $150 each, in an apparently unannounced sale. What a steal for a complete battery-powered portable computer with an internal LCD display, built-in modem, parallel port, serial port, bar-code reader interface, cassette port, and extensive software (word processor and BASIC compiler, for instance) in ROM—and you can upgrade the memory to 32K for under $50!

MAKING IT WORK

Most modem/software combinations are complicated enough to be thoroughly confusing the first time you use them. Be patient the first time you try to get online.

If your system isn't working, make sure that you have selected the correct transmission parameters. The most common parameters are: 8 data bits, 1 stop bit, no parity, 300 Baud, half duplex. Make sure that the modem is compatible with your telecommunications software.

If you have an external modem, check for compatibility with your serial interface, and make sure that the telephone and AC adapter connections are plugged in properly. If you're installing a

Budget Modem Mini-Sampler

Just before we went to press, I surveyed some current magazines and flyers to look for "best buys" in budget modems. *Note*: price and availability of modems such as these can vary widely, and this is by no means a complete or comprehensive guide to what's available—just a short list to give you an idea of what to expect. Addresses and phone numbers are in DataBank.

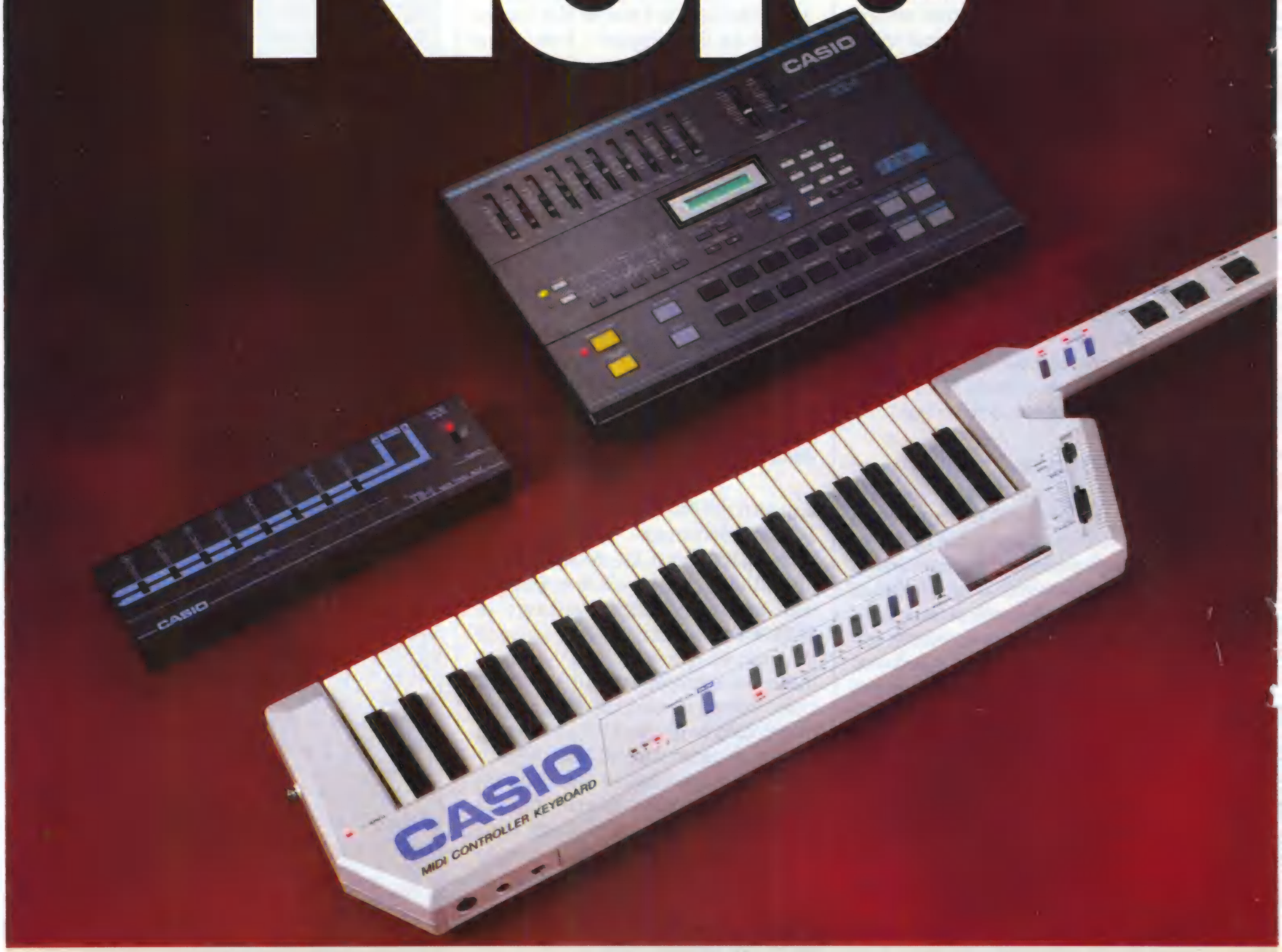
DCM 3 Modem (Radio Shack Sale Flyer #403, June 1986): sale price on Radio Shack 300 Baud, auto-dial/auto-answer unit for TRS-80 and CoCo; does not include software or cables. Catalog no. 26-1178. $39.95.

300 Baud Modem (JDR Microdevices ad in July 1986 *Radio Electronics*, page 107): this is a "Total Telecommunications" brand modem that was manufactured for the Electronic University in San Francisco, to get students online at low cost. E. U. bought too many and dumped a large quantity. The modem includes United Software Industries' *ASCII Pro EZ*, a superb communications program that has a zillion screens of program parameters, on-disk macros, text editing, unattended/remote operation, etc. The software alone is worth more than the package price—and this one sends files without those blasted carriage returns! The only catch is that the documentation doesn't even mention most of the features of *ASCII Pro EZ*. USI offered a proper manual at one time—find one and you're in business. Apple II and IBM PC versions are available (and a slightly different version for the C-64, see below). Very Hayes-compatible. No catalog number. $49.95.

C-64 Modem (C.O.M.B. ad in June 1986 *Modern Electronics*, page 89): this is the Commodore 64 version of the Total Telecommunications modem above. Slightly different software; includes connect-time clock. Outrageously low price. Item no. H-1225. $19.

Computer Info Grabber (DAK Industries "Drew's Trap" catalog, page 23): this is a combination 300 Baud modem and phone/speakerphone with 10-number memory and tone/pulse dialing—*wow*. Made by Unitech; comes with discount for connect time on the telecommunications service *The Source*, but no software or cables (available separately). Catalog no. 4110. $39.90.

Note



Introducing a touch-sensitive system that's not out of reach.

You haven't gotten this far in your career by making compromises. That's the whole idea behind Casio's new line of professional products—uncompromising performance. It's also why we created a whole new division to help you get the most out of it.

And there's a lot to get. Our **CZ-1 ($1,399)** is a full-size, 61-key synthesizer with programmable touch sensitivity. Initial touch, or velocity, can be programmed to control pitch, timbre and volume; while after touch can be adjusted to control modulation depth and volume. It has 64 RAM memories which are loaded at the factory with a powerful assortment of PD sounds, or can hold the same number of sounds of your own creation. (You can still recall any of the factory presets at the touch of a button—even if you have written over them.) Our optional RA-6 cartridge ($89.95) can immediately access another 64 sounds, for a total of 192 sounds in all!

In addition, the CZ-1 has a new Operation Memory, which holds 64 key-splits, tone mixes and other combinations for instant recall in the heat of performing. The key-splits and tone mixes themselves now have added features to give you more flexibility, such as separate stereo outputs, independent detuning and octave shifts.

Of course the CZ-1's MIDI is advanced to the max—an 8-note polyphonic, multi-timbral system, which allows you to assign the 8 voices in any combination over the 16 channels of MIDI for all your sequencing needs.

And so you can easily keep track of all your sounds, the CZ-1 lets you name them yourself and shows you which ones you're using on its bright, back-lit alpha-numeric display.

Strapping on our **AZ-1 ($549)** 41-key, full-size MIDI keyboard con-

worthy.
AZ-1
CASIO
CZ-1

troller is an easy way of adding mobility to your abilities. It's battery powered, touch-sensitive and will support all 128 program changes, even over two MIDI channels. The AZ-1 can be used to control any function of any MIDI instrument on the market by the use of ten controllers, five of which are user-definable. This allows you to customize its performance to match your set-up, no matter how your gear changes.

Adding drums to your system is as easy as plugging in our **RZ-1 ($649)** sampling drum machine. It comes with 12 PCM presets, each with its own line output and volume slider, for ease of mixing.

When you want to add your own sounds, you can record up to four different samples at a 20 kHz sampling rate, with a .8 sec total sampling time. And to make your search for just the right sample easier, it comes with an audio tape of 91 drum and percussion sounds.

The RZ-1 has a 100 pattern/20 song memory and is one of the only drum machines on the market whose memory can accept dynamics from a MIDI keyboard or drum pad. Other features include real or step-time recording, auto-correction up to 1/96 of a beat, and tape or MIDI storage of your pattern or sample data.

Whatever system you're using, our **TB-1 ($89.95)** MIDI switching thru box, will keep it neatly wired with two inputs and 8 switchable thru ports.

Even if price were no object, our new professional line would be a tough act to improve on. As it happens, though, it's the first touch-sensitive system that's not out of reach.

If performing is your life, you owe it to yourself and your audience to check out our performance. It's definitely noteworthy.

CASIO®

Where miracles never cease

Casio, Inc. Professional Musical Products Division: 15 Gardner Road, Fairfield, N.J. 07006 New Jersey (201) 882-1493, Los Angeles (213) 803-3411.

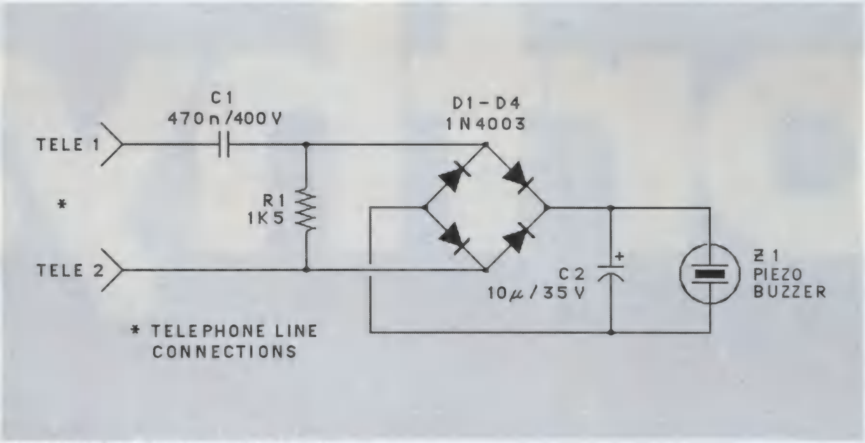


Fig. 1 *Dial-Pulse Annunciator/Ringer*

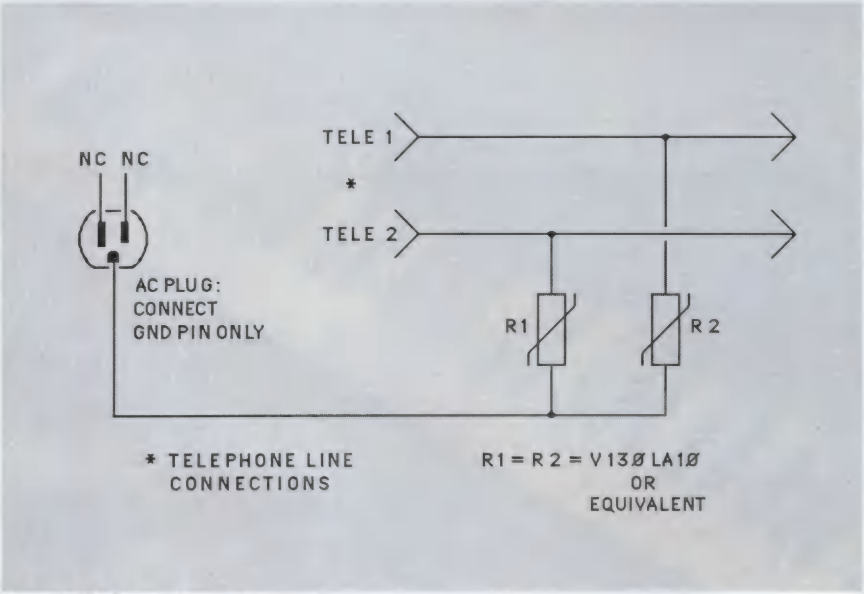


Fig.2 *Telephone Surger Suppressor*

Parts Lists for "Budget Modems"

C1	470n, 400V or greater poly or ceramic disc capacitor (Digi-Key part no. E4474)
C2	10u, 35V electrolytic capacitor (272-1013)
D1-D4	1N4003 1A, 200V PIV silicon rectifier diode (276-1102)
R1	1k5, 1/4W 5% carbon film resistor (271-025)
Z1	Piezo buzzer (276-060 or similar)
Misc.	PC-mount modular phone jack (Digi-Key part number H9041); enclosure; perf board

Fig. 1: *Dial-Pulse Annunciator/Ringer (equivalent Radio Shack part numbers are given in parenthesis)*

R1-R2	GE V130LA10 or equivalent MOV (276-568)
Misc.	PC-mount modular phone jacks; grounded AC line plug; 16-18 gauge stranded wire; enclosure; perf board

*Please note: TELE 1 and TELE 2 normally connect to the red and green telephone leads (the two innermost conductors of modular jack); the circuits are not polarity-sensitive.

Fig. 2: *Telephone Surge Suppressor (equivalent Radio Shack part numbers are given in parenthesis)*

new serial card to drive the modem, *be careful*—it's not impossible to plug a serial card in backwards, which will definitely fry the card.

If you can connect to the desired network, but experience data errors or loss of signal, the cause is probably noise or transients on the telephone line. If the connection sounds noisy or distorted for voice transmission, expect some problems with data transmission. When calling long distance, you can often get a better connection by switching to an alternate long-distance service. If MCI is noisy, try AT&T, or vice versa. Also, calling to or from a given area at sunrise or sunset may increase the line noise; try calling at a later time.

Call-waiting tones can cause data errors and even stop modem transmissions. On AT&T and similar systems, you can disable call-waiting by dialing *53, but you will then have to leave the phone off-hook until you dial (or auto-dial); otherwise, the call-waiting will be reset.

D.I.Y. PROJECTS

Some inexpensive modems will auto-dial, but don't have an annunciator to allow you to monitor the progress of the outgoing call. The simple circuit of **Fig. 1** will "chirp" with each outgoing digit, when dialing in *pulse* mode. The circuit doubles as a remote ringer; decrease C1 to 100n for "ringer only" operation. Note: the values of C1 and C2 are fairly critical—do not substitute.

EM readers are probably aware that you should use suppressors to protect electronic equipment from surges on the AC line, but you should also protect your modem from surges on the *telephone* line. **Fig. 2** shows a simple circuit that will do the job. Note that this circuit is a little unusual because it uses the AC plug only for a ground return; the two plug blades are not connected. Use 16 or 18 gauge stranded wire for the ground connection, and keep this lead as short as possible. Use a small plastic project box to house the project. Mount the modular telephone jacks on a piece of perf board, and drill two oversize round holes in the case to match.

LEARNING MORE

If you'd like to learn more about the technical side of telecommunications, check out these Radio Shack/Texas Instruments books, they're really quite good: *Understanding Data Communications*, Radio Shack, 1984 (cat. no. 62-1389); *Understanding Telephone Electronics*, Radio Shack, 1983 (cat. no. 62-1388). **EM**

Now that your computer knows how to speak MIDI, load in some software and let 'er rip.

Making Your Micro Musical Part 2: The Software

BY CRAIG ANDERTON

In Part 1, we discussed the hardware needed to turn your computer into a musical instrument. But remember, a computer is just a dumb collection of plastic and metal until you load in some software to tell it what to do—so this month we'll look at musical software. Although there are literally hundreds of MIDI-oriented software programs available, they mostly fall into the categories given below.

SEQUENCERS

Sequencers are the most common music programs used with computers. Most sequencers are conceptually similar to tape recorders in that they "record" MIDI data as it flows into the MIDI In connector of the computer's MIDI interface. As mentioned in Part 1 with our player piano analogy, you can then play back that data into a MIDI sound-generating device by connecting the interface MIDI Out to the instrument's MIDI In (**Fig. 1**). Remember, we're recording MIDI data, not an actual sound. Therefore, if you record a particular stream of MIDI data into the sequencer, it can play back through *any* MIDI instrument, just as words typed into a computer can be sent to almost any kind of printer.

Sequencers usually partition the memory into individual software "tracks." Each of these tracks can contain polyphonic data (*polyphonic* parts are chordal, like a piano, guitar, or barbershop quartet as opposed to *monophonic* or single-note parts like saxophone, flute, human voice, etc.). For example, you might want to record a bass part into Track 1, a percussion part into Track 2, a piano-type chordal accompaniment into Track 3, and a solo melody line into Track 4. Each track could play back through a MIDI instrument programmed for the appropriate sound. If that sounds expensive—after all, buying several good MIDI instruments can be costly—relax. There are so-called "multi-timbral" MIDI instruments that can provide multiple, different sounds from one instrument. For example, the Casio CZ-101 can provide up to four individual timbres, and each of these can be assigned to an individual sequencer track. The only drawback in this instance is that each sound can only play monophonically. Still, if you have a CZ and one other instrument, you could play polyphonic lines on the non-CZ keyboard and use the CZ to play solo lines and accompaniment parts.

> *"...sequencers are one of the primary reasons why those with limited technical abilities can use computers to make...highly sophisticated music"*

Although comparing sequencers to tape recorders is useful to grasp the overall concept, sequencers are quite different once you get beyond superficialities—in fact, they can do a bunch of tricks that would be impossible with tape. One of these tricks, called *autocorrection* or *quantization,* rounds off your playing to the nearest quarter note, eighth note, 16th note, and so on. Thus, if your timing is a little bit shaky, the sequencer will tighten up your rhythm to metronomic precision.

Another advantage of sequencers is that if you need to play a particularly difficult part, you can slow the tempo way down while recording and return the tempo to normal speed on playback. And it doesn't affect the pitch which is what would happen if you tried this with a tape recorder. Between this feature and autocorrect, even those who are "all thumbs" can usually manage to obtain musically useful results.

If by now you still haven't made the kind of music you want to hear, then it's time to take advantage of a sequencer's

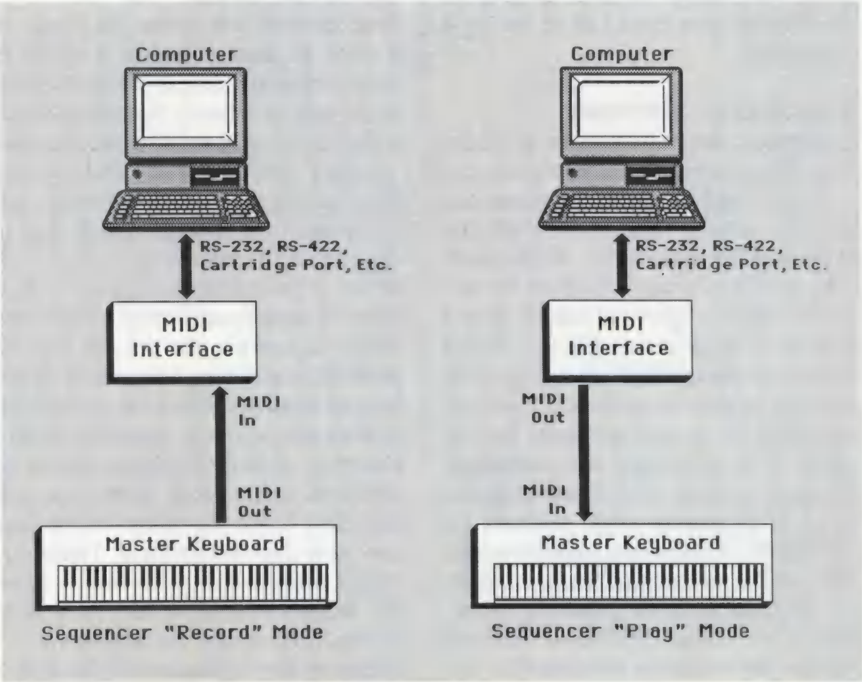


Fig. 1

***Craig Anderton**, when not editing* **EM**, *can be found giving lectures and seminars, playing guitar and keyboards with the group* Transmitter, *and in the summer, immersing himself in the nearest available body of cool water.*

editing capabilities. You can often do "micro-surgery" on a composition, and delete, add, or move notes around at will. On mouse-based computers, this is even a fairly painless task.

A complete discussion of sequencers is beyond the scope of this article, although we have covered many of the basics. Suffice it to say that sequencers are one of the primary reasons why those with limited technical abilities can use computers to make excellent, rhythmically-correct and highly sophisticated music.

Notation/Transcription Programs

A recurring problem for arrangers, recording session leaders, and educators is the transcription and copying of music in standard music notation. Thanks to "music processor" software and such printing advances as the laser printer, it is now possible to work out a complete score on a computer, edit it on the monitor, then print out as many high-resolution copies as desired. In many cases, sequencers have notation and transcription capabilities built-in; however, there are some programs (Personal Composer for the IBM PC and Professional Composer for the Mac, to name two) whose specialty is notation and transcription capabilities. These tend to do a more complete job than "one-size-fits-all" programs that include notation and transcription features as part of a larger whole. Capabilities of transcription and notation programs vary widely, so check carefully for the features you need before buying a sequencer.

Educational Software

Computers are very patient teachers. They'll let you proceed at your own pace and now thanks to MIDI, computers can illustrate musical examples by playing them on MIDI instruments. While much educational software is designed for music education programs in schools, prices tend to be quite reasonable and there's no law that says individuals can't use this software in their own homes. There are programs for several computers, but the Apple II is particularly well supported because so many schools have Apples (next in popularity would probably be the IBM PC). Educational software ranges from simple teaching games for children to complete courses on learning the piano. (The October 1986 issue of **EM** will contain an article on education in the MIDI age.)

Voice Editors

With early synthesizers, each parameter—be it filter frequency, oscillator pitch, level, or whatever—had its own separate switch or control. While convenient, each control added to the expense. To cut costs, manufacturers whittled the number of knobs down to one, included a calculator-type keypad, and assigned each parameter a number. To adjust a particular parameter, you would call up its number with the keypad, adjust the knob for the desired sound, and move on to the next parameter that needed adjustment. Eventually, manufacturers even eliminated that one knob and assigned a range of numeric values for each parameter. Thus, you would enter the number of the parameter to be changed, then enter a number corresponding to the desired parameter value.

While this approach does indeed cut costs, it makes synthesizer programming a tedious process. Voice editors make life easier by displaying all, or most, parameters on-screen. With a mouse-based computer, it's easy to click on the desired parameter, increment or decrement the existing value, then zip along to the next parameter to be adjusted. Voice editors often provide visual displays of envelope shapes and other useful graphic aids that make programming even easier. One program, "DX Droid" from Hybrid Arts, even includes a semi-intelligent random patch generator option—this is by no means a gimmick, but a very useful tool.

Patch Librarians

Synthesizers can create all kinds of sounds, so there is usually a means to store a collection of these different sounds in the synth's memory. Synthesizers typically hold from 32 to 128 different sound "patches" or "programs." Once you've filled up the synthesizer's memory, one procedure is to save the patch data to cassette via the instrument's cassette interface (if provided) so that you can then wipe the memory and create a whole new bunch of sounds. (In the old days of personal computers, before disk drives became small and affordable, cassette interfaces were a popular way to store data.) However, cassette interfaces tend to be slow and rather picky about tape and recording levels, so many instruments now save data to cartridges. These cartridges contain RAM (with battery back-up), or EEPROM, to provide non-volatile storage. However, the convenience of cartridges is offset by the typical cost of $35 to $50 each, which can sometimes work out to over $1 per patch stored!

Once again, MIDI to the rescue. One provision of MIDI is that data representing the various parameters and settings can be sent over MIDI and stored in computer memory (if your MIDI synth implements this feature, of course). From there, it's a simple matter to save this data on disk via the computer's disk drive. Considering that a $2 floppy can hold up to hundreds of patches, the cost savings are obvious. Since most librarian programs can hold more patches than the synthesizer whose patches it stores, one can usually assemble groups of patches from the master "library" of patches. These groups can then be downloaded from the computer into the synthesizer.

MIDI Analysis Software

A recently emerging class of software involves analysis of the MIDI data stream. This simplifies de-bugging and also gives you a "window on MIDI" to check the MIDI channel over which a keyboard is transmitting, whether a keyboard is capable of sending velocity (dynamics-related data), and so on.

MIDI Data Processing Software

Some software processes the actual MIDI data itself. One common example is the MIDI delay/echo program, which would use the hardware connection shown in **Fig. 2.** As you play a note on the keyboard, the computer takes this data, delays it by a user-adjustable amount of time, and sends it back into the instrument's MIDI In connection, thus re-playing the note a

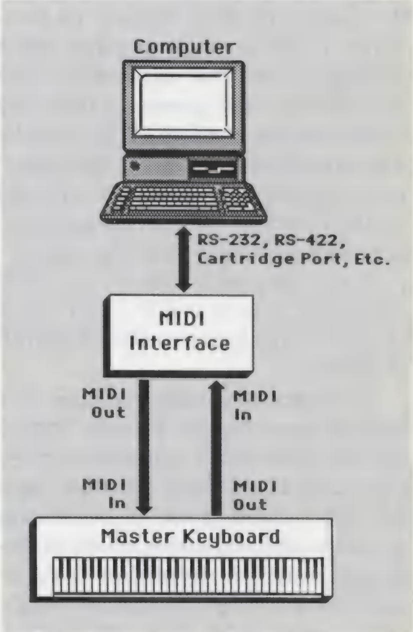


Fig. 2

fraction of a second later than the originally-played note. This produces the ever-popular echo effect. Other MIDI data processing programs can transpose, arpeggiate, or otherwise alter the MIDI data.

PLAY-ALONG PROGRAMS

Some software companies offer recordings of popular tunes, in the form of MIDI data on diskette for specific computers. With these disks you can re-arrange parts, change timbres of melody lines by sending different tracks of MIDI data to different synthesizers, and so on. You can even erase tracks and put on your own parts. These perform a function similar to the "Music Minus One" records of some years back in that you can practice along with backing tracks to improve your musical skills.

KEYBOARD RE-ASSIGNMENT PROGRAMS

A MIDI keyboard is a versatile device, but keyboard re-assignment programs make them even more versatile. These programs let you split the keyboard into different sections, each of which can typically have its own MIDI channel number and sound program. For example, you might program the lowest octave to send out data to a bass synthesizer tuned to MIDI channel 1, the highest octave to send out data over channel 2 to a synth set for a trumpet sound (for playing a lead line), and the rest of the keyboard to channel 3 and have it control a piano sound. Often times these programs also allow for "layering" of sounds (i.e. playing one key triggers two or more independent sounds) and might even allow for arpeggiation and other tricks. The main use of these programs is for professional musicians who have multiple synthesizers and want to control them, in various permutations and combinations, from one master keyboard or other MIDI controller.

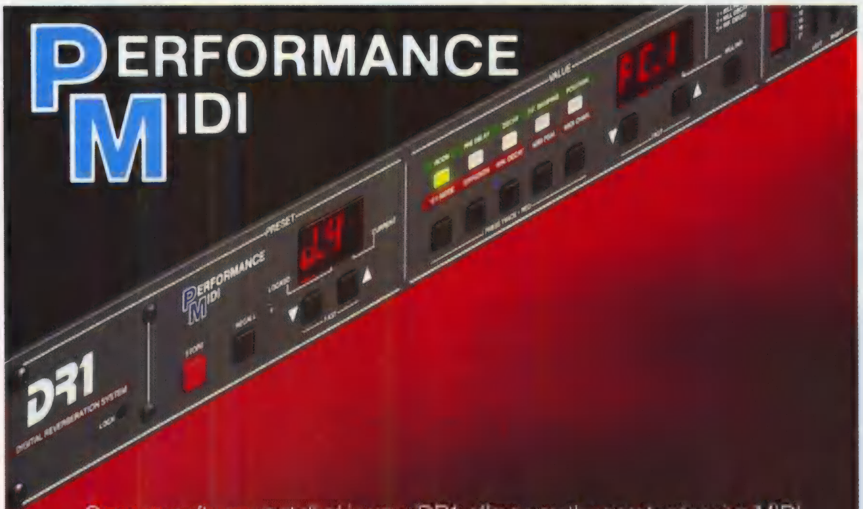
SAMPLING PROGRAMS

Sampling is the process of digitizing a sound (anything from guitar, to piano, to explosions, to sound effects) and storing it in the computer's RAM. Once stored, the sound can usually be edited if you so desire (i.e. you can remove the attack, decay, or some other section of the sound), transposed over a range of notes, and so on. Sampling programs are great fun; sample someone laughing, then transpose it up for chipmunk sounds or downward to hear the sound of Darth Vader in a rare moment of humor. Sampling programs are available for just about all popular computers, and offer a good way to expand a repertoire of synthesized sounds by adding "real world" sounds; or you can just plain have fun taking sounds apart in RAM and putting them back together again.

END OF LINE

So there you have it—a quick tour of how to turn a computer into a musical instrument. But the best part of all is that the musical computer is a truly open-ended device. Many of the software programs described above didn't even exist a couple of years ago; new developments and technologies keep extending the limits of what you can do with a computer. The same computer that provides a child with a fundamental grasp of elementary music concepts might be the same computer that some superstar uses on stage to manage a pile of synthesizers. Inside every computer is a potential musical genie . . . rub it the right way, and it will do magic for you. EM

> *"the musical computer is a truly open-ended device"*



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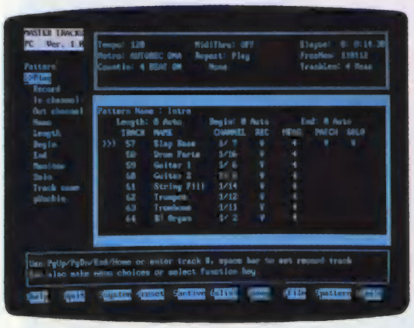
MASTER TRACKS PC is an integral part of today's music technology. It supports the popular MPU-401 MIDI Interface and all MIDI equipped instruments.

MASTER TRACKS PC provides access to the world of SMPTE through MIDI Song Pointer. Now you can easily incorporate MIDI technology into audio and video productions.

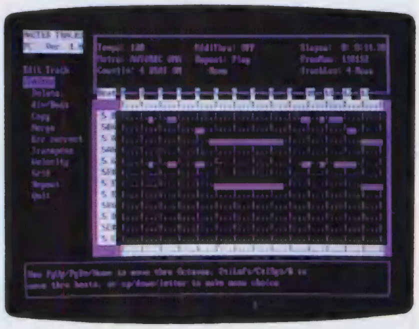
Quite simply, MASTER TRACKS PC was designed to be the best IBM sequencer on the market. Its 4th generation design gives you speed, power and flexibility.

Without compromise.



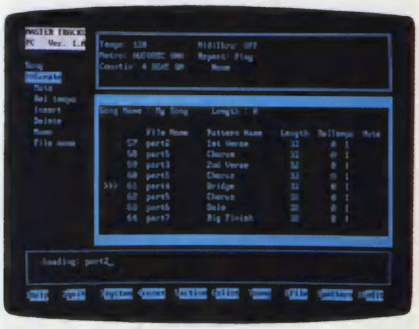
Pattern Window

- Each pattern is a free-form, 64-track scratch pad.
- Create and save any part of a pattern as a phrase, solo, bass line, song section, etc.
- Playback or record from any point in a pattern in real time.
- Record all MIDI events on 16 channels capturing every nuance of your performance.
- Programmable Punch In and Out.
- Mute tracks for mixdown to tape.



Edit Window

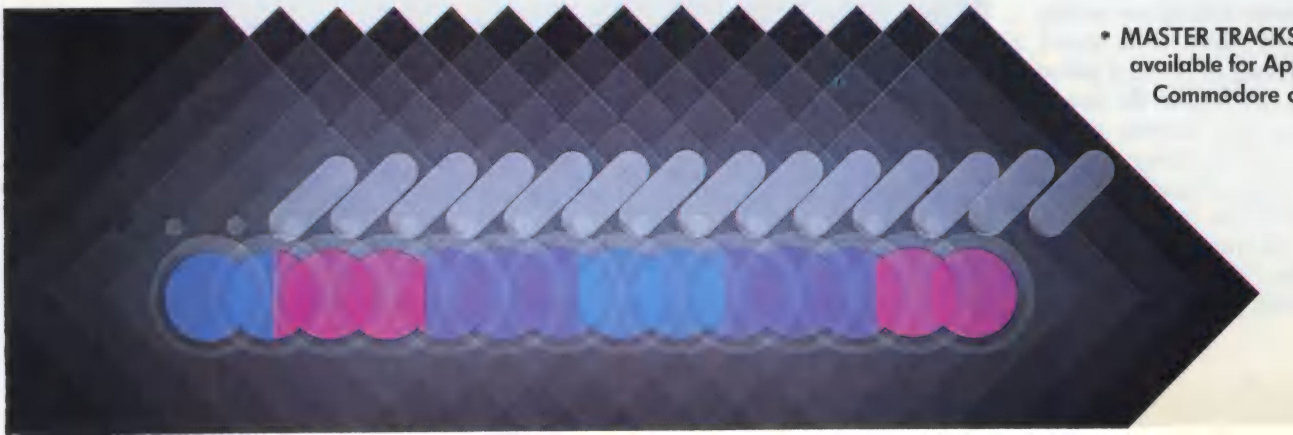
- Error Correct, Merge, Delete, Transpose, Repeat and Copy tracks.
- Change velocity scale for all notes within a track.
- Graphically edit track data on variable resolution grid for visual access to all MIDI events.
- Create new tracks in step time by step entering MIDI events.
- Quickly correct errors in any note, measure or phrase.



Song Window

- Versatile pattern editor lets you combine multiple patterns to create songs, phrases, drum parts, etc.
- Up to 64 repeating patterns can be used in each song in any order.
- Change tempo instantly or gradually at each step.
- Songs can be converted into patterns for use in other songs.
- Create lists of song files for automatic playback of sets.

Color monitor courtesy of AT&T.



* MASTER TRACKS Versions also available for Apple and Commodore computers.

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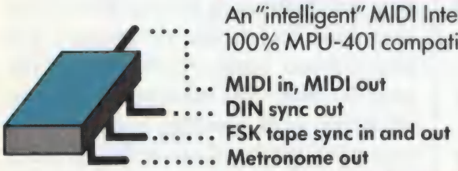
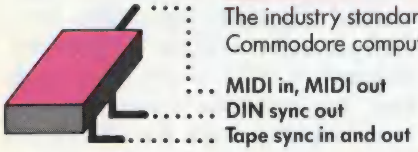


Passport MIDI Interface™ w/Tape Sync

The industry standard for Apple and Commodore computers.



Passport MIDI Interface™ for Apple Macintosh™

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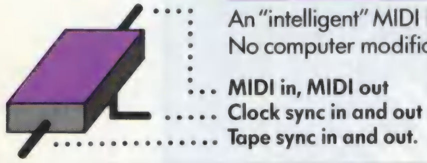


All Passport interfaces are field tested and proven reliable. They're made with the highest quality components and are fully compatible with MIDI.

Passport MIDI Voice Librarians.™

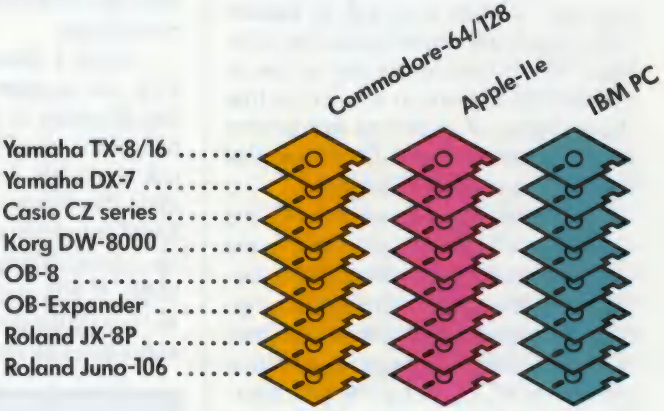
With Passport's MIDI Voice Librarians you get instant access to more than 200 of the latest sounds on disk.

If you make an intelligent comparison, you'll find features in the Passport Librarians that make them the obvious choice.

For instance, you can save and load your favorite presets and banks of sounds on diskette. Create your own custom banks of sounds by organizing and rearranging presets. Monitor your sounds in memory without disturbing the resident presets in your synthesizer.

That's not all. Our Librarians are compatible with DX Pro,™ DX Heaven,™ Data 7™ and a multitude of other popular voicing programs. Preset editors are also available for select synthesizers.

Without a doubt, Passport's MIDI Voice Librarians are the lowest-cost alternative to expensive RAM cartridges or unreliable cassette tape recorders.



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With a C-64 and this program, you can "chew" on the bytes in the MIDI data stream—and see what's really going on.

MIDIPrint: A MIDI Data Display Program

BY JIM JOHNSON

As with all things technical, the only way to get the most out of MIDI is to really understand it. Reading the IMA's MIDI spec is a step in the right direction, and examining the data displayed on a sequencer program's edit screen is also a big help, but still, neither of these really gives you a feel for what's going on. Most musicians take real time MIDI operation for granted—until a sequence or instrument setup glitches, whereupon the most common solution is to call in outside help (which still may not solve the problem). What's needed is a way to look at the MIDI data stream as it is sent so that the operation of individual instruments can be better understood, and complex hookups more easily debugged.

MIDIPrint is a short program for the Commodore 64 that does just that. As the computer receives data, the program converts all status bytes to English descriptions, and prints the associated data bytes in numeric form. The program as written will run on a C-64 with a Passport interface; however, it can be modified to use the Sequential interface, or to run on the Apple II series. It is also quite easy to modify the program to include other features such as printer output, or to display note data in a more easily readable format.

HOW IT WORKS

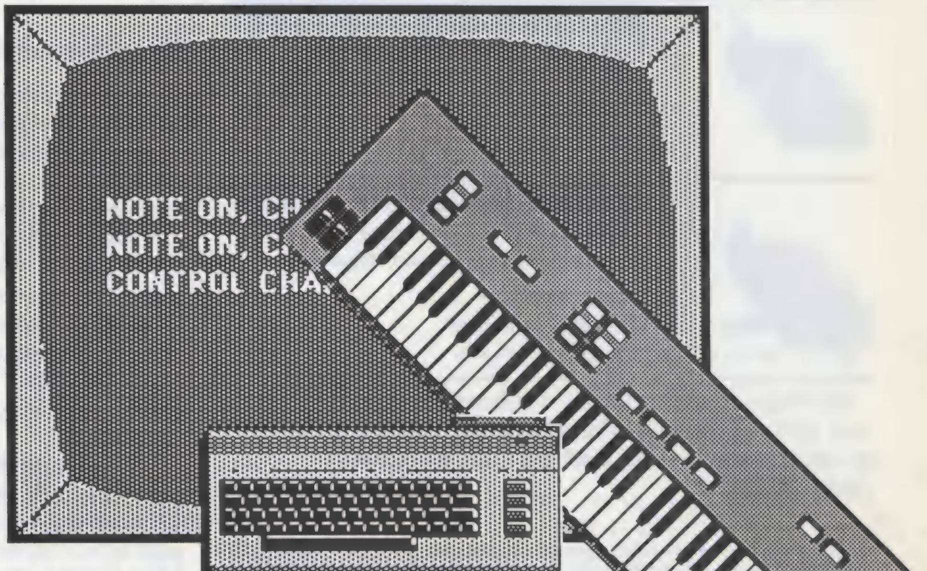
MIDIPrint consists of two sections: a BASIC program that interprets and prints the data, and a machine language program that captures the MIDI data and passes it to the BASIC program. Don't panic if you have no experience with machine language—the BASIC program includes a *loader routine* that eliminates the need for an assembler or other machine language entry program. The assembly listing is included as a reference for experienced technophiles who may want to modify the data capture routine, or to convert it to another machine. I have included spaces between the BASIC statements to improve readability, but the program will run faster if you eliminate all spaces except those within quotes. The text within brackets indicates Commodore cursor movement and screen control characters; replace these with the corresponding single keystroke instructions.

Listing 1 shows the BASIC program. First, the program assigns values to the variables used in the program. Initialization of the variables listed in line 140 is not absolutely necessary but assigning their values early in the program enables BASIC to quickly access them. The variables in line 150 identify locations used for PEEK, POKE, and SYS commands. Line 160 sets up the descriptive strings for the status bytes by reading the data in lines 1010 to 1040 into the array ST$.

Since the machine language (ML) routine is nothing but numbers, for a short program it is practical to store these numbers in a set of DATA statements and put them in memory from the BASIC program—as is done in line 180. After loading the ML, the program jumps to the setup portion of the ML program through the SYS command, and prints a short message on the screen.

Next is the heart of the BASIC program, the main program loop that interprets and prints the MIDI data. First the program checks to see if the space bar is being pressed; if so, the program ends. Otherwise, the program performs a SYS to the machine language routine that pulls a byte from the buffer, and puts that byte in the variable "BYTE."

Fortunately, the MIDI data format is structured in a manner that is fairly simple to interpret. All of the status bytes have values of 128 or more, and all data bytes are 127 or less. Line 250 checks to see if the retrieved byte is a data or status byte, and prints it in decimal form if it is data. Line 260 checks for the value 254 and if found, returns to the start of the loop. Normally this value would indicate an active sense message, but since this message doesn't really provide any useful information, the data capture routine filters all active sense and clock messages to avoid clogging the input buffer. Thus, this byte can be used for a "buffer empty" indicator. If BYTE is any other status byte, then a new line is started and the byte is checked to see if it is a channel



By day, **Jim Johnson** *is a linear integrated circuit test engineer; by night he plays synthesizer in the Phoenix synth trio* girl:bike:dog. *He also writes music software for fun and profit and wears pointed sideburns.*

```
100   REM MIDIPRINT - MIDI DATA DISPLAY
110   REM 4/10/86 BY J. JOHNSON
120   REM
130   REM *** SET UP VARIABLES ***
140   BYTE=1:TYPE=1:CH=1
150   OUTPUT=683:FETCH=894:SETUP=820
160   DIM ST$(17):FOR I=1 TO 17:READ
ST$(I):NEXT
170   REM *** LOAD MACHINE LANGUAGE ***
180   FOR I=820 TO 937:READ X:POKE I,X:
NEXT
190   SYS SETUP
200   PRINT "[CLR][DOWN][DOWN]
   MIDIPRINT 1.0"
210   PRINT "[DOWN]        PRESS SPACE
BAR TO QUIT"
220   REM *** MAIN PROGRAM LOOP ***
230   GET A$:IF A$=CHR$(32) THEN END
240   SYS FETCH: BYTE=PEEK(OUTPUT)
250   IF BYTE<128 THEN PRINT BYTE;:GOTO
230
260   IF BYTE=254 THEN 230: REM END OF
DATA
270   PRINT:REM NEW LINE FOR NEW
MESSAGE
280   IF BYTE>239 THEN 340
290   REM *** CHANNEL MESSAGES ***
300   TYPE=((BYTE AND 112)/16)+1:CH=
(BYTE AND 15)+1
310   PRINT ST$(TYPE);", CH.";CH;
320   GOTO 230
330   REM *** SYSTEM MESSAGES ***
340   IF BYTE= 240 THEN PRINT ST$(8);:
GOTO 230
350   IF BYTE= 242 THEN PRINT ST$(9);:
GOTO 230
360   IF BYTE= 243 THEN PRINT ST$(10);:
GOTO 230
370   IF BYTE= 246 THEN PRINT ST$(11);:
GOTO 230
380   IF BYTE= 247 THEN PRINT ST$(12);:
GOTO 230
390   IF BYTE= 250 THEN PRINT ST$(13);:
GOTO 230
400   IF BYTE= 251 THEN PRINT ST$(14);:
GOTO 230
410   IF BYTE= 252 THEN PRINT ST$(15);:
GOTO 230
420   IF BYTE= 255 THEN PRINT ST$(16);:
GOTO 230
430   PRINT ST$(17);:GOTO 230
1000  REM DATA FOR STATUS MESSAGES
1010  DATA "NOTE OFF", "NOTE ON", "POLY
PRESSURE", "CONTROL CHANGE"
1020  DATA "PROGRAM CHANGE", "CHANNEL
PRESSURE", "PITCH BEND"
1030  DATA "SYSEX START", "SONG
POINTER", "SONG SELECT", "TUNE", "SYSEX
END"
1040  DATA "START","CONTINUE","STOP",
"RESET","UNDEFINED"
1050  REM DATA FOR MACHINE LANGUAGE
1060  DATA 169, 0, 133, 251, 169, 192,
133, 252, 169, 0, 141, 168, 2, 141, 169,
 2
1070  DATA 169, 3, 141, 8, 222, 169,
149, 141, 8, 222, 120, 169, 91, 141, 20,
 3
1080  DATA 169, 3, 141, 21, 3, 88, 96,
72, 152, 72, 173, 8, 222, 74, 176, 3
1090  DATA 76, 120, 3, 173, 9, 222, 201,
 254, 240, 10, 201, 248, 240, 6, 141,
170
1100  DATA 2, 32, 150, 3, 104, 168, 104,
 76, 49, 234, 173, 168, 2, 205, 169, 2
1110  DATA 208, 6, 169, 254, 141, 171,
2, 96, 168, 177, 251, 238, 168, 2, 141
1120  DATA 171, 2, 96, 172, 169, 2, 200,
 152, 136, 205, 168, 2, 240, 3, 141,
169
1130  DATA 2, 173, 170, 2, 145, 251, 96
```

Listing 1 *Basic Program*

message or a system message byte. (Channel messages are numbered 128 to 239, and system messages occupy 240 to 255.) The channel messages are also structured in a fairly straightforward manner, with the four highest bits identifying the message type, and the lowest four bits identifying the channel. This allows us to handle all of these different messages with a single equation that breaks the status byte down into a number that indicates the message type, and the channel number. Note that the lowest four bits actually equal the channel number *minus one*, a fact that seems to be glossed over in most material on the subject. The message type selects the appropriate descriptive string from the array ST$, and prints this along with the channel number.

The system messages are handled by lines 340-430. Since they are not set up in such an orderly fashion as the channel messages, the program must check for each byte individually. Line 430 handles all status bytes not covered by the other lines in this section.

THE DATA CAPTURE ROUTINE

Listing 2 shows the data capture routine assembly listing (this listing was done on the Merlin assembler). The ML program consists of three parts: a setup routine for the interrupt handler, the interrupt handler itself, and a routine to pull a byte from the buffer.

The setup routine (lines 24 to 46) first establishes the start of the ML program at $334 (decimal 820, the bottom of the 64's cassette buffer). Next, the address of the start of the input buffer is transferred to a free location in zero page, which is necessary for doing indirect indexed addressing, and the buffer pointers are initialized. The MIDI interface is intialized by first sending $03 to the MC6850 ACIA chip's control register to reset the device, followed by $95 to configure the chip for MIDI and enable interrupts. Finally, the interrupt vector is changed to point to the location of the interrupt handler.

The first task performed by the interrupt handler is to place the accumulator and Y register on the stack. Once this is done, the program checks the MIDI port's status register to see if the interrupt was generated by incoming MIDI data. If not, the program pulls the accumulator and Y register off the stack, and jumps to the normal interrupt routine. If there is data in the MIDI receive register, it is loaded to the accumulator and checked to see if it is an active sense or clock message, in which case the program reacts as if no data was received. All other values are stored in the temporary location MIDIBYTE, and control is transferred to the buffer routine FIFOIN.

In order to keep the data in the proper order, the program makes use of a first in, first out buffer, or FIFO for short. This buffer consists of 256 bytes starting at $C000, which is the bottom of the 64's free memory area. To speed up access to the buffer, the top and bottom of the buffer are defined by two pointers called FIFOLO and FIFOHI. FIFOHI is incremented as each new byte is added to the top of the buffer, and FIFOLO is incremented as each byte is pulled from the bottom. The buffer input routine first compares these registers to determine if the buffer is full. If FIFOHI is one less than FIFOLO, then the buffer is full and FIFOHI is not incremented, since this would cause the data at the bottom of the buffer to be corrupted. In either case, the data in MIDIBYTE is transferred to the top of the buffer. If the buffer is full, this will cause the data at the top of the buffer to be overwritten, which will result in an incomplete message; unfortunately this is the best that we can do in this situation. After transferring the data, the program jumps to the normal interrupt handler.

The routine starting at line 73 unloads the FIFO. This is where the BASIC program jumps when it executes the SYS FETCH statement in line 240. This routine first checks to see if the two pointers are equal, which indicates an empty buffer. If this is true, then the buffer empty indicator is stored in the output register; otherwise the byte at the bottom of the buffer is transferred, FIFOLO is incremented, and the computer returns to the BASIC program.

Interpreting The Data

After you've entered the program, and saved it to disk, the next step is to hook your computer to your synthesizer and try it out. (After all, that is why you typed it in!) Play some notes on the MIDI keyboard or other controller, then examine the screen's output. You should at least see a *note on* message, followed by some numbers. But what does this tell you? This question is best answered by an example.

Let's look at the outputs from three different instruments: a Juno 106, a Jupiter 6, and a DX7. Pressing and releasing the lowest C on the keyboard gives the following display for the Juno:

```
NOTE ON, CH. 1 36 64
NOTE ON, CH. 1 36 0
CONTROL CHANGE, CH. 1 123 0
```

```
 1 ******************************
 2 *                            *
 3 *       MIDIPRINT3.0.S       *
 4 *         4/10/86 BY         *
 5 *        JIM JOHNSON         *
 6 *                            *
 7 ******************************
 8 *
 9 * ADDRESS LIST *
10 *              PASSPORT       SCI
11 FREKZP    =      $00FB
12 VECTOR    =      $0314
13 INTERUPT  =      $EA31
14 MIDICON   =      $DE08       * $DE00
15 MIDISTA   =      $DE08       * $DE02
16 MIDIRCV   =      $DE09       * $DE03
17 FIFOBOT   =      $C000
18 FIFOLO    =      $02A8
19 FIFOHI    =      $02A9
20 MIDIBYTE  =      $02AA
21 OUTPUT    =      $02AB
22 *
23 **** SETUP ROUTINE ******
24 * MOVE FIFO ADDRESS TO ZERO PAGE
25           ORG    $334
26           LDA    #<FIFOBOT
27           STA    FREKZP
28           LDA    #>FIFOBOT
29           STA    FREKZP+1
30 * INITIALIZE FIFO POINTERS *
31           LDA    #0
32           STA    FIFOLO
33           STA    FIFOHI
34 * INITIALIZE MIDI PORT *
35           LDA    #$03
36           STA    MIDICON
37           LDA    #$95
38           STA    MIDICON
39 * INTERRUPT HANDLER SETUP *
40           SEI
41           LDA    #<IRQHAND
42           STA    VECTOR
43           LDA    #>IRQHAND
44           STA    VECTOR+1
45           CLI
46           RTS
47 *
48 ***** INTERRUPT HANDLER *****
49 * POLL MIDI PORT FOR INTERRUPT *
50 IRQHAND   PHA
51           TYA
52           PHA
53           LDA    MIDISTA
54           LSR
55           BCS    MIDIIN
56           JMP    EXIT
57 * RECEIVE MIDI BYTE *
58 MIDIIN    LDA    MIDIRCV
59 * FILTER ACTIVE SENSE & CLOCK *
60           CMP    #254
61           BEQ    EXIT
62           CMP    #248
63           BEQ    EXIT
64           STA    MIDIBYTE
65           JSR    FIFOIN
66 * JUMP TO NORMAL INTERRUPT *
67 EXIT      PLA
68           TAY
69           PLA
70           JMP    INTERUPT
71 *
72 **** PULL BYTE FROM FIFO ***
73 FETCH     LDA    FIFOLO
74           CMP    FIFOHI
75           BNE    FIFOCONT
76           LDA    #254
77           STA    OUTPUT
78           RTS
79 FIFOCONT  TAY
80           LDA    (FREKZP),Y
81           INC    FIFOLO
82           STA    OUTPUT
83           RTS
84 *
85 **** ADD MIDIBYTE TO FIFO ****
86 FIFOIN    LDY    FIFOHI
87           INY
88           TYA
89           DEY
90           CMP    FIFOLO
91           BEQ    NEXT
92           STA    FIFOHI
93 NEXT      LDA    MIDIBYTE
94           STA    (FREKZP),Y
95           RTS
```

Listing 2 *Assembly Listing*

The Jupiter prints:

```
NOTE ON, CH. 1 36 64 36 0
CONTROL CHANGE, CH. 1 123 0
```

And the DX7:

```
NOTE ON, CH. 1 36 100
NOTE ON, CH. 1 36 0
```

Three different instruments provide three different responses to the same input! No wonder problems sometimes occur. Actually, all of these responses are valid according to the MIDI spec; they are just different ways of saying the same thing. In the case of the Juno and DX, a separate "note on" message is sent for the key up and the key down events. The two bytes following each "note on" byte are the note value and velocity data. For the Juno, the velocity for the first note on is 64, the default velocity for non-velocity-sensitive keyboards, and the second velocity is zero, which is equivalent to a note off command. The Jupiter, however, only generates one note on, followed by four data bytes. This an example of what is called running status. In order to streamline the MIDI data flow, the spec requires that a new status byte be sent only when a new message type is sent (for instance, a pitch bend in the middle of a series of note ons). In addition, the Roland instruments send an all notes off message (the control change following the note data) when all the keys on the keyboard are released. This is done to take care of any notes that might have missed their note off commands, though this could conceivably cause problems on some instruments.

APPLICATIONS AND LIMITATIONS

One application is to troubleshoot complex (and sometimes even simple) MIDI systems. For some musicians, it's not enough to simply accept that "these instruments don't work together." If you can locate the source of the problem, then perhaps you can figure out an alternate setup that will work. For instance, when the Juno 106 is in its transmit/receive mode III (transmit/receive all), patch changes sent from a master Juno will be received by other Junos, but not other instruments, even though bender and pedal information is still transmitted. Examination of the Juno's output with MIDIPrint reveals the problem—when in mode III, the Juno sends a short system exclusive (sysex for short) message instead of a patch change command.

But to me, the most exciting application of this program lies in decoding system exclusive messages. If you have a keyboard like the Yamaha KX88 or a sequencer such as Dr. T's Keyboard Controlled Sequencer, which allows you to send sysex data from within the sequence or from the front panel, then knowing the specific syntax of your synthesizer's sysex codes will allow you to do all kinds of neat things such as sequenced timbre changes, programmable drum mixes on machines without this feature, and even storing DX7 function data. Unfortunately, most manufacturers seem to want to hide their sysex commands from their customers (one manufacturer publishes the sysex codes for its drum machine in the repair manual!), but with this program, that obstacle disappears.

Due to the size of the FIFO buffer used in the machine language portion of the program, as well as the slow speed of BASIC in emptying that buffer, there is a definite upper limit to how much data you can capture with the program and still display it reliably. If you try to read the output of a multi-channel sequencer, or if you try to send the computer a patch data dump, the program chokes after about a minute. The usual result is that the screen displays incomplete MIDI messages. When this happens, you can get back to proper operation by waiting until the garbage clears itself from the screen, and continuing. MIDIPrint works fine for the purpose for which it was intended, which is displaying small amounts of MIDI data; but if you must display large blocks of data, some of the suggestions listed in the next section might help.

MODIFICATIONS

The nice thing about do-it-yourself BASIC programs is that they are very easy to customize to meet specific requirements. For instance, to convert this program to run on Sequential compatible interfaces, simply substitute the following data statements for the corresponding lines in the program:

```
1070 DATA 169, 3, 141, 0, 222, 169, 149, 141, 0, 222, 120,  169, 91, 141 20, 3
1080 DATA 169, 3, 141, 21, 3, 88, 96, 72, 152, 72, 173, 2,  222, 74, 176, 3
1090 DATA 76, 120, 3, 173, 3, 222, 201, 254, 240, 10, 201,  248, 240, 6, 141, 170
```

Another mod can change the program output from the screen to the printer, so that you can examine the data in a more leisurely fashion. To do this, make the following changes:

```
225 OPEN 4,4
230 GET A$: IF A$=CHR$(32) THEN PRINT#4: CLOSE4: END
```

You will also need to replace every occurrence of the PRINT statement after line 240 with PRINT#4, (including the comma).

As the program stands, pitch data is printed in numeric form—not the prettiest approach. If desired, you could add a branch to a conversion subroutine after line 300. Without going into much detail, this subroutine would need to divide the pitch value by 12 to determine the octave, and use the remainder to determine the note. Remember that adding this to the program will slow it down somewhat.

If you are willing to dive into the machine language portion of the program, then there are a number of potential changes that could be made to optimize MIDIPrint for different applications. As previously mentioned, the ML section contains a filter to keep active sensing and clock data out of the FIFO; this idea could be extended to exclude pressure or any other data type if needed, or you might want to eliminate the clock filtering if you are examining sequencer outputs for timing problems. If you are a hardcore computer addict, you might try rewriting the ML to increase the size of the buffer, or you could add a second, larger buffer which would be emptied after the data reception stops. Finally, if you are familiar with BASIC compilers, a compiled program would eliminate most of the speed problems caused by the BASIC portion of the program, though you might have to relocate the ML and storage locations to avoid conflict with your compiler.

Even if you don't want to modify the program, it is definitely worth the effort to type it in and keep it around. It may not be very glamorous, but it provides an effective way to really dig into the essence of MIDI.

REFERENCES

MIDI Interface User's Manual, Passport, 1985. Covers the Passport interface and the MC6850 in detail.

Model 242 Operation Manual, Sequential, 1985. The complement to the Passport manual; covers the SCI interface and BASIC and ML programming techniques.

The Complete SCI MIDI, Sequential, 1984. This document contains the complete MIDI 1.0 spec, as well as extensive information on individual SCI instruments.

Programming the Commodore 64, by Raeto Colin West, Compute! Publications, 1985. Covers just about everything there is to know about the 64.

The Detailed MIDI Specification, International MIDI Association, 1985.

The present-day composer refuses to die. . .and his life support system is a Synclavier.

Frank Zappa and His Digital Orchestra

BY JOHN DILIBERTO

While waiting to interview Frank Zappa, I overheard a phone conversation with drummer Chad Wackerman. Zappa had just returned from filming an episode of TV's Miami Vice *and was denigrating the script—"It is so putrid"—his clothes—"It was like Ronald MacDonald"—his role—"What do you get to be on there? A cocaine dealer. That's all that show's about"—and the "pastel policeman."*

After all was said and done, however, Zappa waxed philosophical. "I'm really glad I did it though," he admitted, "because it was so sick. It's really one of the sicker things a human being can do."

If anyone knows about the sick things a human being can do, it's Frank Zappa. For over 20 years he's been garroting American culture, sub-culture, counter-culture and culture clash in a string of recordings that began in 1966 with Freak Out! *Hippies, punks, Valley girls, and Congress fall equally before his venomous pen.*

For those who love to hate Zappa, he presents an easy target, but laced between Zappa's satirical acid is an acute social consciousness, reflected in his longstanding voter registration pleas and his recent crusade against the Parents Music Resource Center (PMRC).

Also buried in there are Zappa's serious music aspirations. While singing the praises of "Dinah Mo Hum," he's also sung the praises of Edgar Varese, Anton Webern, and other serious 20th Century composers and pioneers. In recent years, he accomplished the goal of realizing his orchestral works with recordings by the London Symphony Orchestra and Pierre Boulez' Ensemble Intercontemporain. But these were only temporary and expensive fixes for Zappa, who has found a more permanent solution to his addiction, the Synclavier II.

In 1982, Zappa released Shut Up 'N Play Yer Guitar, *a three record set of guitar solos compiled in answer to his fans' demands. A similar refrain may soon be heard, not because Zappa's talking too much, but because he recently put down his guitar in favor of the Synclavier II computer music system. Not just any Synclavier, but the $200,000 deluxe model.*

The first releases of this music were heard in 1984 and 1985 on The Perfect Stranger, Frank Zappa Meets The Mothers of Prevention *and* Francesco Zappa, His First Digital Recording In Over 200 Years. *He calls his Synclavier the Barking Pumpkin Digital Gratification Consort, replacing the Abnuceals Emuukha Electric Symphony Orchestra and Chorus of* Lumpy Gravy, *and as you'll read, Zappa believes he's found the answer to his deepest desires—recording orchestral music—even if the orchestra is digital.*

I spoke with Zappa at his home in Los Angeles, ushered into the sanctum sanctorum of his 24-track digital studio by Dweezil, with a sullen, "Frank wants you to set up in here."

As I neared the studio, the sounds of a crazed metallic mallet orchestra lashed out, silenced by Zappa as I entered. He took the only arm chair in the room, with a microphone sticking mysteriously out of the wall overhead, lit up his everpresent Winston, took the phone call from Wackerman, and with the snide exuberance that only Zappa can muster, proceeded to talk about his latest sonic assault.

EM: *You said that you haven't played the guitar in two years.*

FZ: Well, I pretty much haven't touched it for the last two years 'cause the last tour was '84, and after the tour I went to work right away on mixing the live tapes. I had to deliver a CD to EMI for this live stuff *(Does Humor Belong In Music?)*, and finish the video editing on a television show. Then I got the extra components for this machinery here (the Synclavier) and I just got into working with that.

EM: *You've said that when you play the guitar, you like to make it talk. Can you do that with the Synclavier?*

FZ: Oh yeah! Sure can.

EM: *For the Francesco Zappa project, how did you put the performance together?*

FZ: I had an assistant at that time named David Acker. There are two ways of enter-

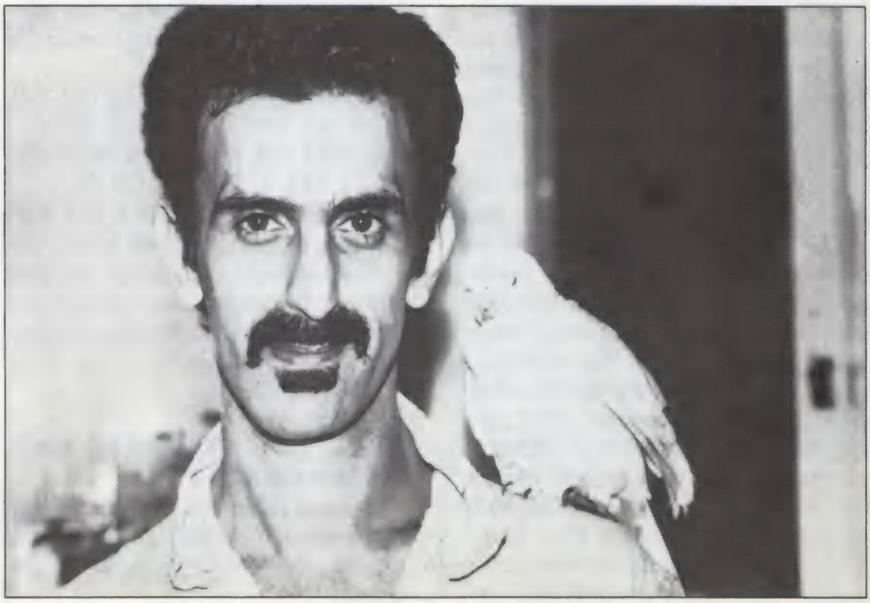


PHOTO: LYNN GOLDSMITH, INC.

John Diliberto *is the producer of* Totally Wired: Artists in Electronic Sound, *a weekly program on electronic music produced for Pennsylvania Public Radio Associates and broadcast on public radio stations across the United States.*

ing material into the Synclavier. One way is with the Script language, which is all letters and numbers and stuff. Or you can do it by playing, then editing what you played by a couple of different means. Anyway, I never learned how to type their Script entry and he knew how to do it. So he took the original manuscripts that we'd gotten from the Berkeley library and the Library of Congress and typed them in. We also researched the ornamentation of the period and whenever there was a little "chingus" over the note, we put in the right twirls...

So I just experimented around with orchestration to make it as colorful as I could. That was all done with synthesized sounds. It wasn't done with any samples. I didn't have any sampling stuff working then.

EM: *You've spoken often about your frustrations working with studio musicians, particularly string sections. Are you using the Synclavier as a way around them?*

FZ: Oh, it's better than a way around it. Because this allows you to make sounds that, although they can be very orchestral, surpass the wildest possibilities of any kind of instrumental ensemble. It's more than just alleviating the tension; it's opening up a whole new dimension.

EM: *Do you think you can exist, or co-exist in this acoustic dimension with this instrument if you chose to?*

FZ: Well, obviously you haven't heard what the machine can do or you wouldn't ask that question. Yeah, it does it. What it sounds like in polyphonic sampling is determined by the quality of the samples you put into it. We do a lot of sampling right here under really laboratory conditions. So I've got one of the finest collections of samples anywhere, most of them in stereo.

For example, we have a big concert marimba. You set up two microphones over it and as you sample each note on the marimba and lay them onto the key, you automatically get the same kind of panning that the stereo microphones hear. When it plays back your sequence, you really get the sensation that you are hearing a musician who is playing something that is utterly impossible.

EM: *You've always used electronics in your music, one way or another, but until recently you've never played much synthesizer on your records.*

FZ: Right, although I've always had other keyboard players. I'm not a keyboard player—although I've dabbled in it for little cheezoid parts and stuff—and you usually have to be one to "play" the synthesizer. That's not what I'm doing now, though, because you can enter data into this system by playing at a slow rate, and it's velocity and pressure sensitive so you can put a lot of expression into what you play. Then you can crank the speed back up to where you want it, and edit what you've played by several different means.

EM: *So you played the Synclavier pieces on* The Perfect Stranger *on the keyboard.*

FZ: Yeah!

EM: *Did you alter the parts once they were in?*

FZ: Yeah, with the editing. You can also enter notes just from the typewriter. You can play something in and if you feel something's missing some place, you just type a few things and you have notes there. The only drawback is that if you've played something with keyboard pressure and velocity sensitivity, the notes you type in are always at 100 percent so they will pop out.

EM: *You seem to prefer very metallic percussive sounds and timbres in the Synclavier music of yours that I've heard on record.*

FZ: Well, that's not true of the recent stuff (*Mothers of Prevention*), and even that doesn't bear any resemblance to what the stuff sounds like now since I bought extra memory for it that allows me to have instrumental ensembles that I couldn't have before. For the *Mothers of Prevention* album, I had only six megabytes of RAM and a 20 megabyte Winchester (hard disk drive). Now I have two 80 megabyte Winchesters, plus 20 megs of RAM. I can store quite a bit of stuff in there and have more elaborate ensembles playing the material back.

EM: *So if this is your way around or beyond an orchestra...*

FZ: Forget about the orchestra. It's beyond the orchestra. Because what this enables me to do is the same thing a painter gets to do. You get to deal with the material in a real and instantaneous way. You go boop and it's there. You don't sit down and write it out painstakingly over a period of years and have the part copied and hope that some orchestra will have enough time to devote to a rehearsal so they come within the vicinity of what your original idea is. There is no doubt about it that if you can play on this thing and hear what you're playing, you have total control of your idea. Good, bad, or indifferent, you get to take the rap for it without having to share any blame with some malfeasance on the performance level when you write it out in a normal way.

The economics of the time being what they are, I see nothing but bleakness ahead for people who still have to write it on a piece of paper and give it to a human being to play it, because there's not enough money to pay for rehearsals. The tendency in most modern music concerts is, since they know there's no money for rehearsal, they write increasingly easier or more minimalist pieces requiring less and less skill. That's what's getting funded. The economics took its toll on the cultural life of America for sure.

EM: *You've had a few of your orchestral works performed by the London Symphony Orchestra...*

FZ: Yeah! Right! And those pieces cost a fortune. I could've bought two of these machines for what the LSO album cost me.

EM: *And what about the pieces commissioned by Pierre Boulez?*

FZ: Well, that wasn't really orchestral. That was only a chamber orchestra with only 27 pieces and there's a slight difference.

EM: *Are you doing outboard processing on the Synclavier?*

FZ: You mean when it goes to tape? Sure! We add digital echo to it and there's some equalization that's done, especially on some of the synthesizer sounds that come out of it since there's no tracking filter in there. It's digital synthesis; the synthesizer sounds in that machine are subject to aliasing noise and that often has to be filtered off.

EM: *On the track "Outside Now Again," was the solo on that improvised?*

FZ: Yes. It came from the *Joe's Garage* album on a song called "Outside Now." That's why it's called "Outside Now Again" on the Boulez album.

EM: *So this wasn't improvised on the Synclavier.*

FZ: No, it was played on the guitar. Then it was transcribed by Steve Vai. Then the transcription was entered into the Synclavier.

EM: *How does your current use of the Synclavier relate to some of the musique concrete things you did on early Mothers' albums?*

FZ: Well, I can do concrete there too, because of the way the system operates. They have these things called patches. A patch is a list of what sound lives under each key. You can have a different sound under each key and they can be any sound. It can be thunder under middle C and a frog on C# and a car crash on D and anything you want. If you play a normal piano part on there, you get very unusual things coming out. Or you could have the whole keyboard be the voices of people from the Congress.

EM: *Edgar Varese was an early influence on you and he was an early pioneer of musique concrete with "Poeme Electronique" and*

"Deserts." I recall when we spoke before that you didn't think very highly of those works.

FZ: That could possibly be due to the timing of when I heard it. Since I had more or less grown up with the pieces on *EMS-401* (the first recording of Varese's works) and none of them were electronic, when I finally heard "Poeme Electronique" on the Columbia album they did when he was around 80 years old, I had heard other types of electronic music. His may have come first (it didn't) and it may have been the pioneering thing (it was), but my ear had already been exposed to other albums. So it wasn't as shocking or extreme as hearing "Octandre" or "Ionizations" for the first time.

EM: *What were some of those other electronic works?*

FZ: "Vale of Orpheus." There was an album out of early French music and I believe it was Pierre Schaeffer. Also there was a guy (Tod Dockstader) who was a disc jockey out of Denver, Colorado. He wasn't a composer in the normal sense of the word. He had a number of releases on an obscure label called Owl. One of them was called *Quatermass*, and I think I have three of those. He was more of an engineer then a composer, but to me some of those compositions work better than the supposedly serious big shots from Europe.

I remember reading about a thing called the Mixtur-Trautonium. All the things that this musicology book said about it the Synclavier now does. One of the things mentioned was chordal glissandos of kettle drums. You can have that if you want it on here.

EM: *What's the difference in your compositions between music and sound effects?*

FZ: It depends on the function. If I had my way, I'd orchestrate the sound effects on everything and the only thing that keeps me from doing that right now is the amount of digital storage in the machine. If I extracted some examples from my sound effects library and loaded them in and wanted to build a composition out of them, I wouldn't have enough memory storage for the samples of the other instruments.

EM: *They also have a guitar interface for the Synclavier...*

FZ: I don't speak highly of it.

EM: *Why?*

FZ: Because of the way it works. The problem with making a guitar trigger a synthesizer is that it can't start doing the calculation to determine what the pitch of the string is until after the burst of white noise that the pick produces has died off. So they have a variable delay that keeps the computer from listening to the pitch until after the white noise is gone. That means that if you're playing fast on it, nothing comes out. So it makes it a little bit awkward to play it as if it was a guitar. You have to baby it along. Some people can get around on it, I can't. It's just too awkward to me.

EM: *It seems like the people I've heard using it don't get the feel or flexibility of sound of a guitar in terms of expression, attacks...*

FZ: Well, I hear a guitar a different way than most other people hear it. Unless you can get the feeling of the instrument and use it like an instrument, it seems like a waste of time. And their instrument is not a good-feeling instrument.

EM: *In the early days of the Mothers, almost all of your effects were tape effects.*

FZ: Yeah, razor blade edits. I still do razor blade edits.

EM: *Even with the Synclavier?*

FZ: Sure! If you've got 16 tracks and you have a complicated orchestration in there and you suddenly want to make a drastic change from one section of the music to another, the only way to do it, unless you have more channels or more RAM, is to print the two sections onto the tape and cut them together.

EM: *You're in a position where you can have anyone you want playing on your records. Yet, you've been working solo recently with the Synclavier. Do you think that cuts you off from...*

FZ: From humanity?

EM: *No, but other musicians' inputs, the sort of feelings that other people can bring to your music and the collaborative aspect of music.*

FZ: Well, my music has never been very collaborative. It's been accommodative, because when you hire a musician you can't always get that musician to play what you thought up because musicians are not uniformly expert in different fields. You put together a band, you have to average out the assets and liabilities of each musician and then find what the style of that band is going to be. So you have to compromise the pieces because you might have a drummer who can play anything, but a rhythm guitar player who might sing great but can't count and couldn't play any parts. Or a piano player who has a certain amount of technical expertise but doesn't know what it means to play a whole note rest and leave some space in the music. So everything gets adjusted for the personnel. But with this, the only thing I have to adjust for is how much RAM I've got in the machine.

EM: *What about live performances? Would you go out with the Synclavier?*

FZ: I've been trying to figure out whether it's practical. I've talked to an agent about it and discussed the possibility of a tour in the fall, but without a major advertising campaign to create an interest for what that machine can do or what I'm doing with it, I doubt whether a tour like that would attract much attention. I'm certainly not going out and playing "Dinah Mo Hum" or the rest of that stuff anymore because that's like—what?—that's a million years ago.

EM: *You don't think your audience would come out for it?*

FZ: A certain number of them would and the rest of them would be disappointed because I wasn't playing songs off the *Sheik Yerbouti* album. The thing about live performances is that people don't come to hear live music, they come to hear what you played on the record. So everybody's got a different idea of what their favorite record is and an audience for my show thinks, "I want to hear songs off that one, I want to hear songs off that one."

That's one of the reasons why, when we do a tour, the pieces that are familiar pieces are all rearranged because they have to accommodate the instrumentation and the playing techniques of the guys on the road at that time.

EM: *Does this mean you'll have two separate musical directions now or are you saying you're not touring with the band anymore?*

FZ: Well, if I take this thing out, there's two ways to do it. One is me and a technician and this machine and that's it. The other way is to take a rhythm section and have a few musicians playing along with it. I've done some experiments with that. I've got a bass player and a drummer who can keep up with it, but then you ask yourself, does that make it better or what? Because the machine can do it all by itself.

EM: *But what about the idea of a live performance being people playing live... Wouldn't that eliminate any spontaneity you might have in a live performance?*

FZ: Well, what can I say? I'm doing this kind of music these days. If somebody wants to see this kind of music manifested live, there's no other way to do it. Human beings cannot play this music. It can only be played by a machine.

EM: *This means you'll be going towards the instrumental music of* The Perfect Stranger *instead of something like* Thingfish?

FZ: *Thingfish* is done, that's history.

EM: *Did you play with the 4X Real Time Synthesizer at IRCAM?*

FZ: Sure did. I'm disappointed that they didn't make it available commercially because the 4X, magnificent as it is, is actually cheaper than this machine by at least half. At the time I was there, the price that was quoted for a full-bore 4X system was about a $100,000. What's sitting behind you there is about $200,000.

But it does some things that the 4X won't do. At the time I saw the 4X, it had no music printing or music editing program that came close to what the Synclavier has. However, now that it has MIDI ports on it and can be interfaced with other devices, if they ever do make the 4X available commercially and there was a way to MIDI the two together, that would be an incredibly frightening piece of machinery.

EM: *What can the 4X do differently?*

FZ: The 4X has the equivalent of a thousand oscillators in it. It has a little fader panel that controls different parameters and you can operate it like a mix and you can control the nuances of tempo and dynamics after your sequence is loaded into the thing. For the demonstration they gave me of the musique concrete possibilities, a guy played this strange garbling weird sound and said "Do you recognize that?"

I said "No!"

He pulled the fader back down to take it out of its process and it was playing "Why Does It Hurt When I Pee?" from the *Joe's Garage* album. Another thing it did was take a speaking voice and make it sound drunk, pitched it, made it whisper and a lot of neat things like that.

EM: *Are you MIDIing the Synclavier to other synthesizers?*

FZ: Yeah, you can go in and out on this machine. You can do interesting things with this Roland device called an Octapad, which is just this little set of plastic squares that you hit with a stick and it has a MIDI output on it. So if you have any percussion technique at all, you can do rolls on the pad, and roll a percussion sample in the machine; or if you have a mandolin sample, you can trill the mandolin. This keyboard doesn't speak very well for fast repeated notes, but one buzz roll with sticks on an Octapad will let you enter that kind of data into the sequencer.

EM: *I understand you've redone some of* Lumpy Gravy *with the Synclavier.*

FZ: I digitally remastered all the early Verve albums. They've been released in a box called *The Old Masters.*

EM: *But I understand that you replaced some of the parts on* Lumpy Gravy *with the Synclavier.*

FZ: The version that went out on *The Old Masters* didn't have any of the new souped-up stuff because I figured that the

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audience for that probably wouldn't enjoy it. They would probably rather have a cleaned up digital re-master of the original. But I did do a bunch of work on it and I don't know whether it will come out.

EM: *You record digitally and you're re-issuing old Mothers' records on CD. What differences have you discovered with the digital process?*

FZ: With digital, you find out how noisy your microphones actually are. You find out how much noise actually lives in the board. In order to clean that stuff up, you have to be more careful about the way you record things. Everything shows. We gate audio as much as possible and for sounds that don't gate well, we use either Burwens or Dynafex to minimize any kind of unwanted stuff. You can't make it go away but you can disguise it to the point where it's not offensive.

EM: *Do you sample just for kicks or do you go into a project and decide you need certain sounds you don't have?*

FZ: We have sampling sessions, like I hired a saxophone player to come up here because as far as I know, none of the sample libraries that Synclavier puts out has a stereo tenor sax playing sub-tone notes. I've got that and I've got all the tenor saxophone honking notes, squealing notes and special effects tenor saxophone noises. Then we did the clarinet: short notes, long notes, the whole range of the instrument, close-miked, distant miked.

Then we did a session with all the different components of the drum set. Ordinarily when a drum kit is sampled, you have the drum kit set up with the ordinary miking and the guy goes okay, here's the tom-tom and boom, he hits the tom-tom. He hits the snare, the kick, and so forth. But along with that, you have all the resonant noise of all the rest of the components of the drum set, all the metal, all the unwanted stuff that's in there.

We sampled all the components of the set isolated from everything else. So I've got pure roto-toms, pure snare drum, pure tom-toms, pure kick, pure high-hat, pure cymbal crashes. It's a very startling sound when you hear real drums in real stereo with none of the reflected sound, none of the sound you'd get if you just turned the mikes on a drum set. It's surrealistic, totally surrealistic.

EM: *Have you gotten involved with re-synthesis?*

FZ: Yeah! The difference between re-synthesis and ordinary synthesizer sound is in normal synthesizer sound you build a wave form and that's your sound and it remains static over time. With re-synthesis, the computer will look at a sound and divide it up into things called frames that go by in time, and each frame is a totally different waveform. So the effect, when you hear it, is different from an ordinary synthesized sound.

It's not quite as realistic as a sample, but it avoids some of the bad features of a sample. With a sample, as you move it to the extremes of the keyboard, it goes Mickey Mouse at the top and gets aliasing noise at the bottom. You can avoid some of those nasty effects by re-synthesis for certain types of sounds which translate well, like brass, for instance. It re-synthesizes very nicely. Clarinet is fair, bassoons are shady, and flutes are fair. We've done vocal re-synthesis.

EM: *You talk about solving musical problems. Why do you have different problems than a composer had 200 years ago?*

FZ: It's the same problem. It's the blank page problem. It's the same problem a painter has with a blank canvas: what are you going to do with it and why?

EM: *Why do you need all this technology to solve the problem and back then they just needed a few musicians?*

FZ: Because back there they didn't have the musician's union. It was a different world. Maybe they had more rehearsal time and they could write things that would get played.

EM: *So you think that the musician's union is holding back you and other artists?*

FZ: No! I think all unions are. I don't mind saying that I am anti-union. The union mentality has affected the arts drastically in the United States. The worst example would be the stage hands union, which in many instances earns more than the musicians who are playing.

EM: *The music that you've done on the Synclavier has been outside and avant-garde. It's tonal, but it's jagged, disruptive, with odd rhythms. Where do you think the audience is for that?*

FZ: I don't know. The first audience is right here in this chair. If I don't like to listen to it, I'm certainly not going to share it with anybody else. If somebody else happens to like it, it's terrific. I'm prepared to have everybody on the planet hate what I do. I simply don't care.

Some people like it, the same way I liked Varese when I heard Varese, and other people hate it the same way many people hated his music when it first came out. I used to bring friends over to the house and say "Listen to this," and they'd say "Are you crazy? What is that?"

EM: *They use to do the same thing to me when I played* Freak Out!

FZ: It's a vicious cycle (laughs). **EM**

Ensoniq Application Note #2

There's no telling what a drummer might do with a Mirage ...

Mirage
OUT
IN

If you're a keyboard player, don't ever let a drummer borrow your Mirage . . . you might never get it back. If you're a drummer, ask a keyboard playing friend to lend you his Mirage . . . "for a while." In either case, if you're into percussion, there's a score of good reasons to get your hands on a Mirage.

The buzz on the buzzword
"Sampled Percussion" is a pretty catchy buzzword. Some high-end electronic percussion systems offer sampling as a creative option. Others offer a selection of sampled sounds on ROM's that plug into the system.

The Mirage can sample any sound in the percussion family — or any other family, for that matter. There's also a wide range of percussion sounds on 3.5″ diskettes in the Ensoniq Sound Library, from acoustic and electronic drums to kalimba and Fu Yin gong.

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Now that we've gotten all these great percussion sounds into a Mirage, how do we get them out? Naturally, all the sounds can be played in real time from the keyboard. Since the Mirage can hold up to 16 samples, you can play a full drum set or complete percussion at any one time.

You can use the on-board sequencer to build up patterns, or use an external MIDI sequencer to create and edit complete songs. Just play the part on the keyboard or, if your sequencer has step editing, write the appropriate MIDI note number on the right beat and lock in a solid groove.

How to become an Octaman
Most drummers will argue that playing percussion is no fun unless you get to hit something. We agree. MIDI features that can put you in touch with a Mirage are showing up on electronic drum kits. And our friends at Roland have come up with a MIDI percussion item that's simple and inexpensive — the Octapad*.

As the name implies, the Octapad gives you 8 pads to hit and each pad can be assigned a MIDI channel and MIDI note number. Add a Mirage, a MIDI cable and a pair of drum sticks and you've got a potent percussion instrument.

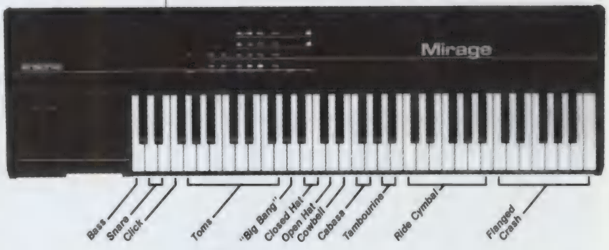
Let's start by creating an electronic drum kit. Connect the MIDI out of the Octapad to the MIDI in of the Mirage and load Sound 2 (Electronic Drums) from Sound Disk 4. The Mirage now has 12 distinct electronic percussion sounds ready to go, including full octaves of toms, ride cymbals and flanged crash cymbals.

Set the Octapad and Mirage to the same MIDI channel and choose any 8 sounds by entering the MIDI note number into the Octapad for each sound. The keyboard map shown here will give you a guide. You've now got an 8-piece electronic drum kit that's ready to record, sequence or play live.

Mirage means melodic percussion
You can follow the above procedure to use any of the Mirage percussion sounds with the Octapad — but why stop there. One of the strongest advantages of the Mirage/Octapad combo is the ability to play percussion using any sound in the Ensoniq Library.

By selecting MIDI note numbers you can easily program scales into the Octapad to use with Mirage steel drum, marimba, hammered piano, bass, harp, vibes or whatever. Because the Octapads are velocity sensitive, you'll be able to control the dynamics just as you would any acoustic percussion instrument.

If you want to get a bit more outside, try playing brass and orchestra hits, guitar power chords, sound effects and pipe organ through the Octapads — there are over 300 sounds in the Ensoniq Library just waiting to get pounded.



All this and a keyboard, too
As you can see, the Mirage isn't just a great keyboard, but a versatile drum machine, too. With some additional MIDI gear, it can be downright amazing. Visit your authorized Ensoniq dealer for a full demonstration. There's no telling where a Mirage and your imagination can take you.

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Tickle that dinosaur and give it some new sounds.

MXR Drum Computer External Sound Module

BY MICHAEL DOSA

When drum computers first came out, I had to have one—and at that time, the MXR 185 Drum Computer seemed to have the best price-to-features ratio. About a month after I purchased the MXR I called them to ask about the plugs on the back panel, and was told they were going to add a memory expansion kit when the prices of memory chips came down, and also, an external module to easily change sound chips. The thought of changing sound chips without opening up the unit was just what I wanted. Six months later, MXR became ART and the 185 was dropped from its product line, but that didn't stop me from pursuing the idea of interchangeable sound chips. The back panel of the 185 has a connector called "external voice (bell)," and that was all I needed to get going. The external sound chip module described in this article plugs into the External Voice connector and lets you easily change sound chips.

***Michael Dosa** has an A.S. degree in electronics and has played bass in bands since high school. He has a small 8-track recording studio which he says "brings me my most enjoyment in blending music and electronics together."*

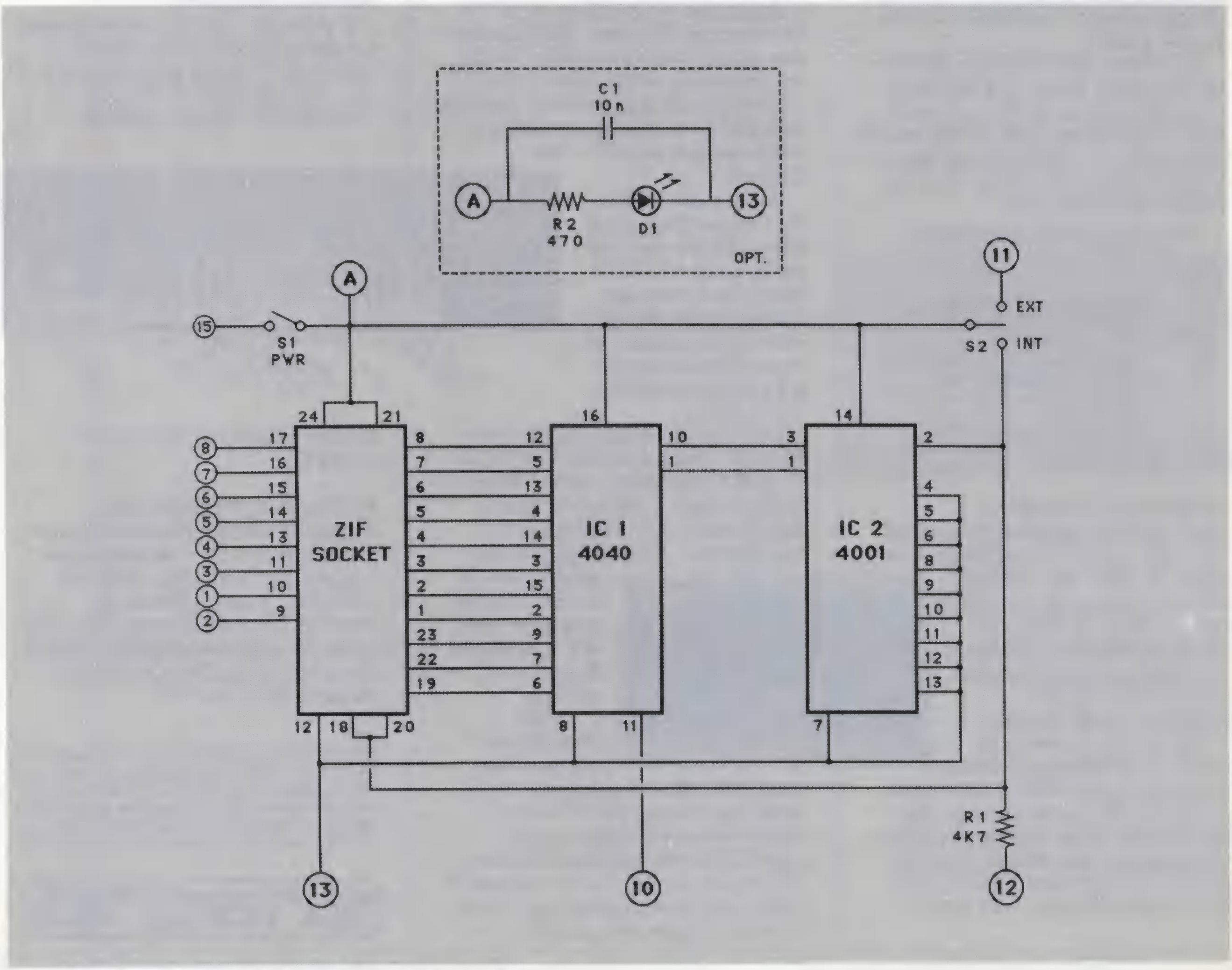
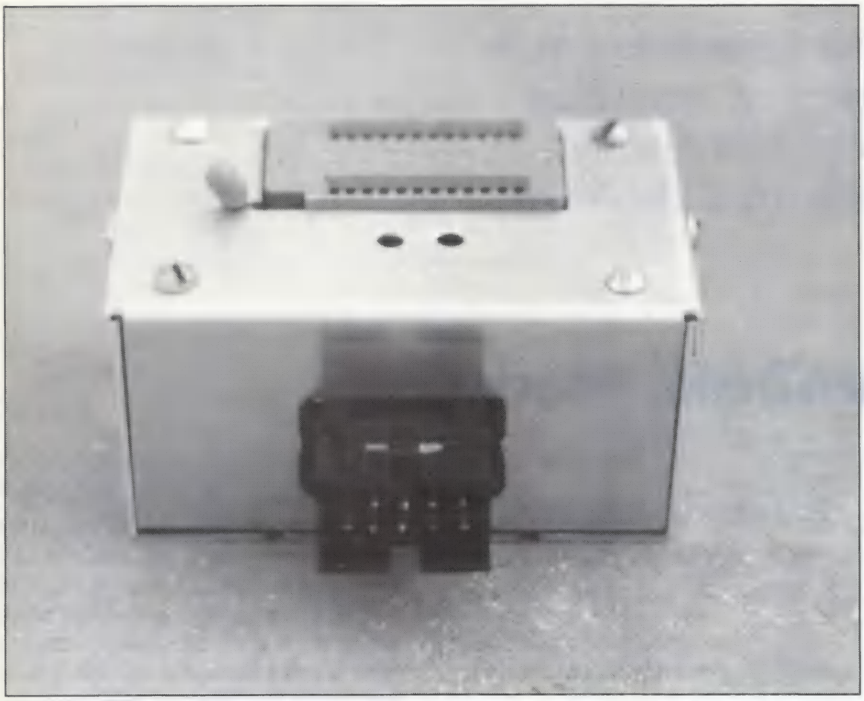


Fig. 1 *MXR Drum Computer External Sound Chip Module*



> *"The thought of changing sound chips without opening up the unit was just what I wanted"*

The 185's internal bell sound is on an 8×2K EPROM chip, the 2716. Since the external voice connection parallels the bell sound chip, all external sound chips must therefore be 2716s.

CONSTRUCTION

The first step is to cut a hole in the external sound module chassis box for the plug that mates with the 185's external voice connector. The circled numbers in the schematic (**Fig. 1**) refer to the external voice plug numbers to which the various points connect.

To facilitate plugging and unplugging of large chips such as EPROMs, use a ZIF (zero insertion force) socket. These have two positions, open and closed. When open, a chip can be inserted in the socket with no insertion force required. Closing the socket grips the IC pins in the socket and makes for a firm connection. Note that different ZIF sockets are configured differently; how you mount yours in the box depends on which type you use. In any event, make sure there is adequate space to move the lever or handle that provides the open/close function.

The optional circuit consisting of D1, C1, and R2 form a power-on indicator for the external sound chip module. C1, a 10n capacitor, filters the +5 Volts DC going to the module. This part of the circuit may be omitted if desired.

All parts are inexpensive and easy to find, except for the socket plug. I got mine from AMP (1840 Wilmington Ave., Compton, CA 90220; tel. 213/639-1691); the pin housing number is 1-480620-9 and the pin number is 350036-2. The project was quite easy to put together and took only a few hours.

HOW IT WORKS

Switch S1 turns the +5 Volts DC to the module on or off. Switch S2 switches between the internal bell sound or external sound chip. When you push the bell button, IC1 is reset to a count of zero. Then a pulse train (active low) feeds pin 2 of IC2; this causes IC1 to count and step through the addresses of the EPROM, thus playing back each sample of the sampled sound. The pulse train also feeds the EPROM's enable pins, 18 and 20. IC2's other input (pin 1) connects to IC1's address 12 line; a signal appearing on this line terminates the count.

I have used the module with sound chips purchased from MXR and also sound chips I have made myself with a Commodore-64. If anyone has any questions about the project, feel free to write a letter to me (enclose a self addressed stamped envelope) at 6003 Fiesta St., Ventura, CA 93003 and I'll try to help you out.

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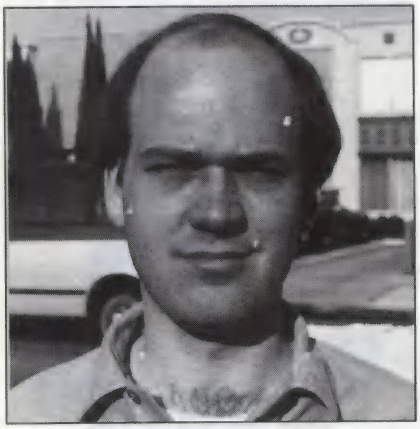
Did you know your DrumTraks can do a Phil Collins thwack? A bomb blast and explosion? Steel drums, nasty hissings, and even stereo tom rolls? They're all yours with the . . .

Sequential DrumTraks Mods

BY ERIC BARBOUR

The DrumTraks digital drum machine from Sequential was the first drumbox on the market to allow programmable pitch tuning and volume of its EPROM-recorded drum sounds. Fortunately for the mod-minded, the circuit uses a D/A converter and analog multiplexer to let its microcomputer control the playback rate of the sounds. The control voltages go to square-wave oscillators (556s), which clock the counters that play back the EPROM drum sound data. What all this means is that by changing the rate at which the counters count, we can change the playback pitch. With a few judicious mods, the DrumTraks can be easily modified to allow for very low playback pitches, as well as external pitch control via control voltage, all without affecting the programmable tuning function. Also presented is a small circuit addition to fix one of the DrumTrak's biggest limitations: toms that can't be separated in a stereo mix.



__Eric Barbour__ has been working with synthesizers since high school. He has a BSEE as well as many years of professional experience in designing digital and microprocessor-based electronics. He helped found the avant-industrial group Black Iron Prison, and is currently working on digital synthesis software.

> *"The clap becomes an even bigger bomb blast"*

Remember that all this voids your warranty, so proceed with much caution.

MOD ONE: ULTRA-LOW PITCH SHIFT

Changing the clock speed of the 556 oscillators can provide drastic pitch-shifting that turns the standard sounds into something totally different. Referring to **Fig. 1**, mount a mini-toggle switch on the rear panel below the hinge (drill the hole *very* carefully, and be sure to clean all metal chips off the printed circuit board before turning on the power.) Attach a suitable capacitor (as described below) to one switch lug. Then run two wires (one from the other switch lug and one from the other end of the new capacitor) to the capacitor for the sound you want to modi-

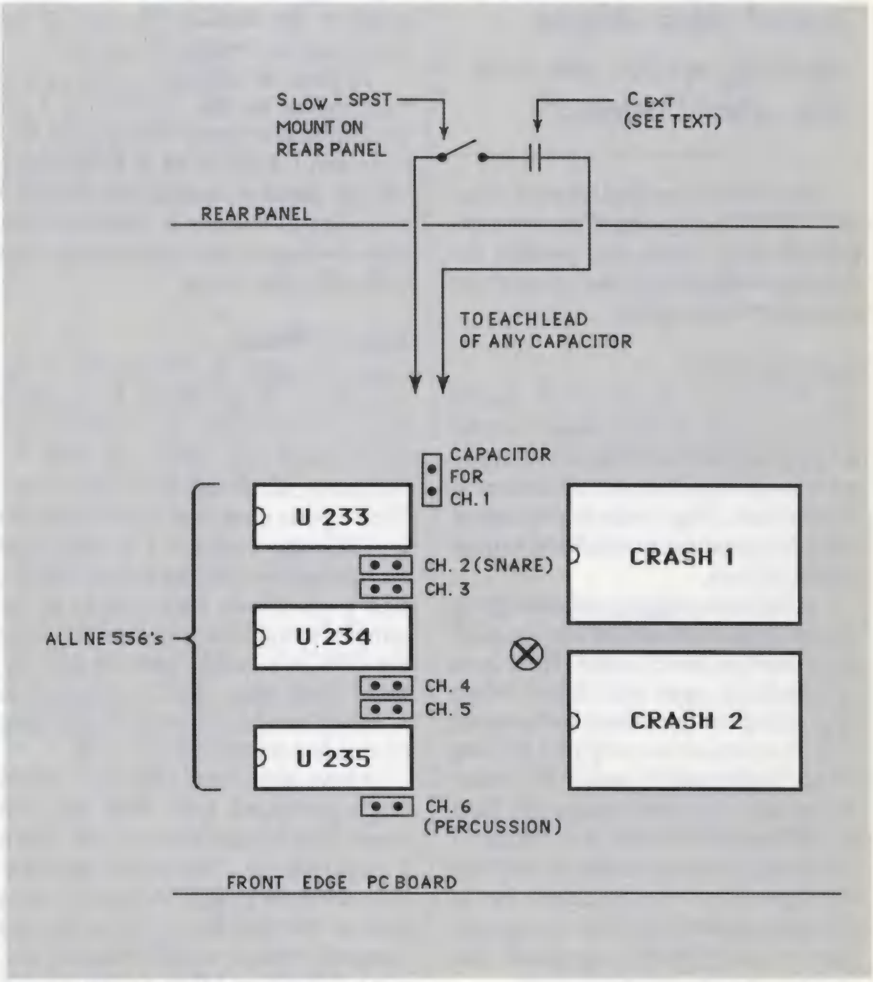


Fig. 1 *Pitch-shifting by changing clock speed*

fy. Thus, closing the switch will parallel the old and new capacitors. This approach works best on channel 2 (snare; use 20 nF for Cext), and on channel 6 (percussion; use 100 nF for Cext).

The slowed-down snare sounds like a huge explosion! Slowing down the rimshot produces a weird, snarelike thwack (use a noise gate, and presto: instant Phil Collins snare). The clap becomes an even bigger bomb blast. The tambourine becomes an eerie shriek, the cowbell sounds more like a 10-foot-wide steel drum, and the cabasa produces a nasty hissing.

MOD TWO: EXTERNAL CONTROL VOLTAGE INPUT FOR INDIVIDUAL CHANNELS

See **Fig. 2**. Mount a ¼-inch jack on the back panel (observe the same precautions as above), and, as shown, run a 1k resistor from its tip contact to the IC pin corresponding to the desired channel number for the mod. Your choice of ICs and pins (U233, U234, or U235, pin 3 or 11) determines the channel to which the control voltage input will be added. Be very careful when soldering your wires to the 556 pins—use a light touch and very little solder. This mod affects all the sounds on that channel. Note that the control voltage (CV) input is *reversed* from the standard convention: increased CV gives a *decreased* pitch. Try feeding envelopes, LFO outputs, or whatever control voltage sources you have handy into the drums for some interesting effects.

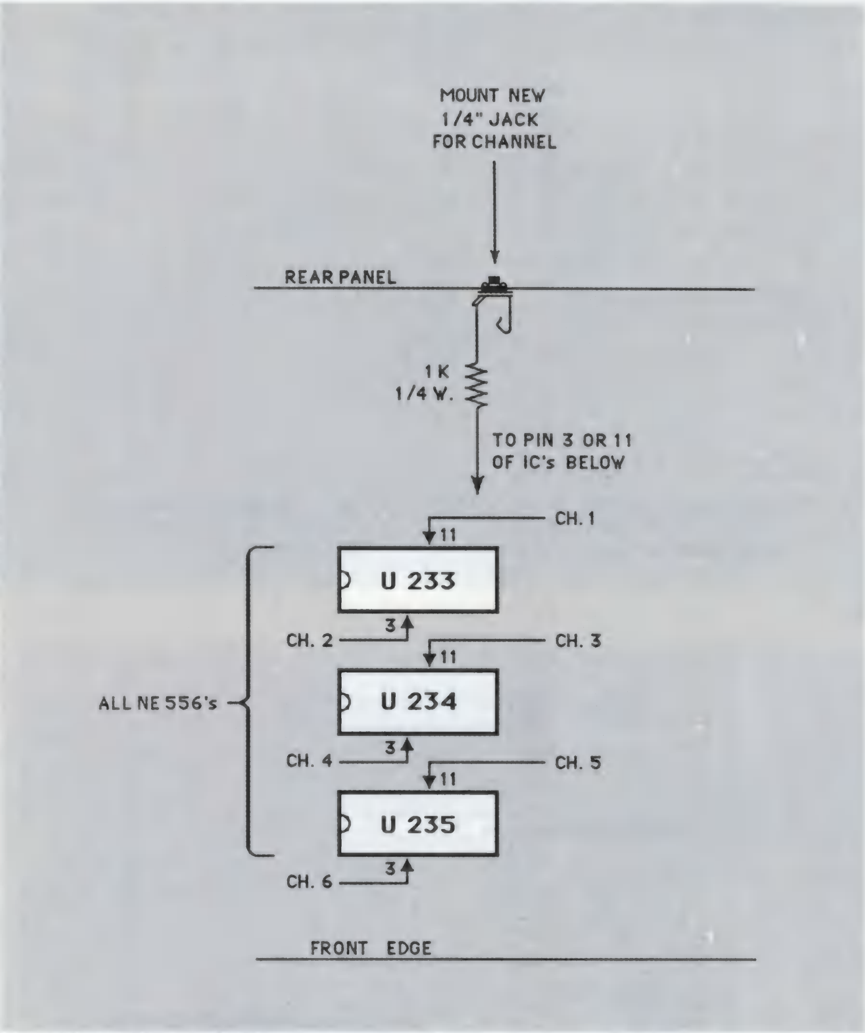
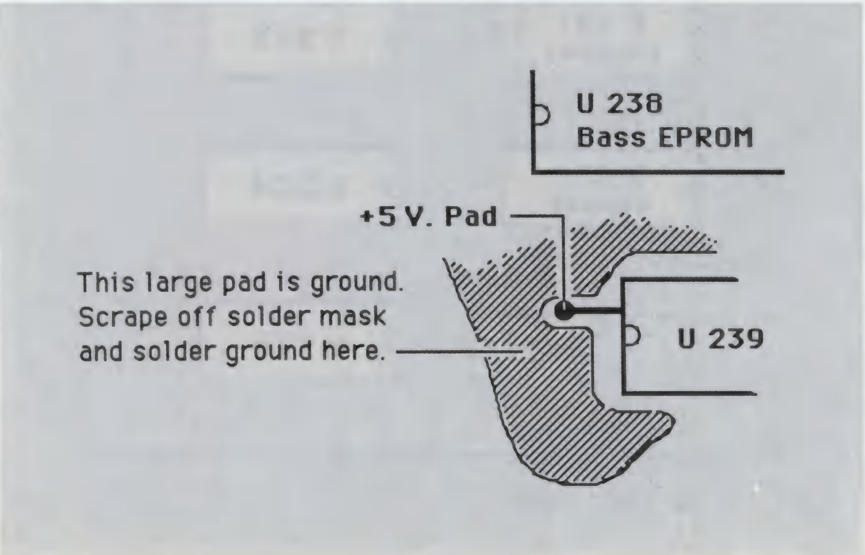

MOUNT NEW 1/4" JACK FOR CHANNEL
REAR PANEL
1 K 1/4 W.
TO PIN 3 OR 11 OF IC's BELOW
CH. 1
11
U 233
3
CH. 2
CH. 3
11
ALL NE 556's
U 234
3
CH. 4
CH. 5
11
U 235
3
CH. 6
FRONT EDGE

Fig. 2 *External control voltage*

MOD THREE: INDIVIDUAL TOM OUTPUTS

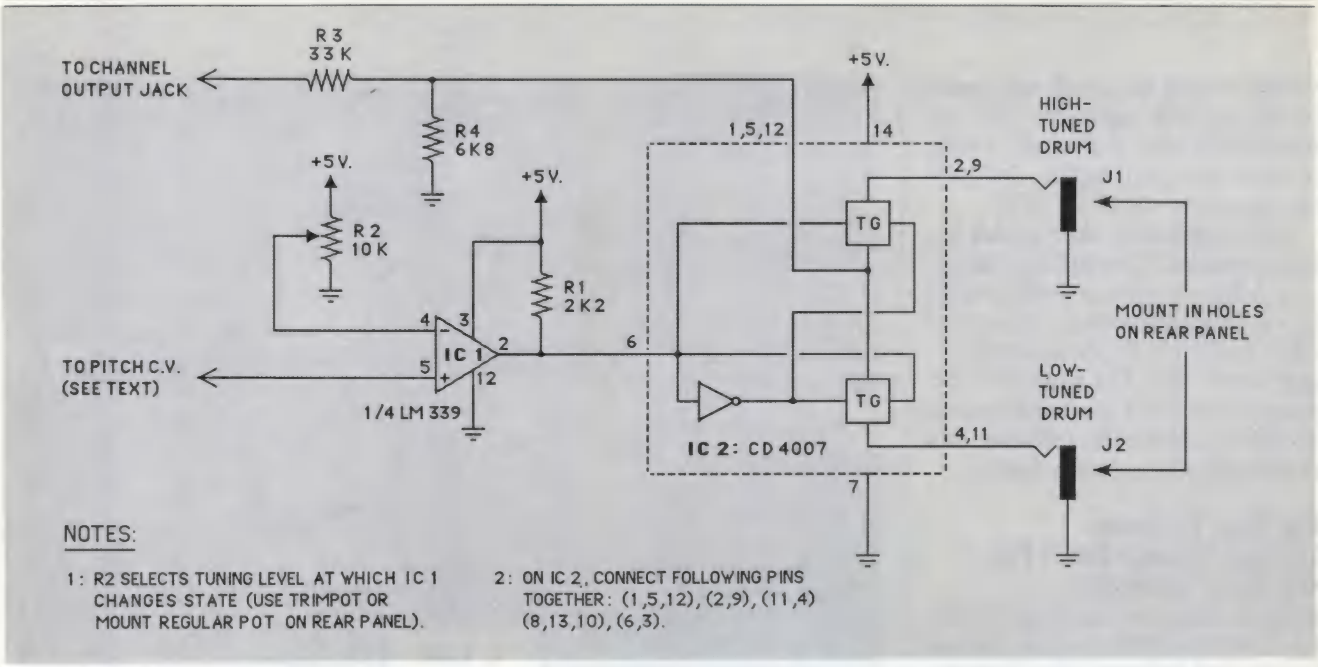
This circuit uses a comparator to sense when the tuning voltage applied to the 556 control input exceeds a preset level (as set by R2; this can be a trimpot if you prefer not to drill another hole in the rear panel). The comparator output then feeds a 4007 CMOS IC, configured as two 4066-style transmission gates and an inverter, to switch the audio signal to one of two output jacks. This allows for a stereo tom roll, normally difficult to do on this machine.

Fig. 3 *(Right) Where to tap +5v power*


U 238
Bass EPROM
+5 V. Pad
This large pad is ground. Scrape off solder mask and solder ground here.
U 239

PARTS LIST

Resistors *(¼ Watt, 5%)*	
R1	*2k2*
R2	*10k*
R3	*33k*
R4	*6k8*
Semiconductors	
IC1	*LM339*
IC2	*CD4007*
Miscellaneous	
J1, J2	*Open circuit ¼-inch mono phone jacks*


R3
33K
TO CHANNEL OUTPUT JACK
+5V.
R4
6K8
1,5,12
14
HIGH-TUNED DRUM
+5V.
2,9
J1
R2
10K
+5V.
TG
R1
2K2
MOUNT IN HOLES ON REAR PANEL
4
3
IC 1
2
6
TO PITCH C.V. (SEE TEXT)
5
12
LOW-TUNED DRUM
TG
1/4 LM 339
4,11
J2
IC 2: CD4007
7

NOTES:

1: R2 SELECTS TUNING LEVEL AT WHICH IC 1 CHANGES STATE (USE TRIMPOT OR MOUNT REGULAR POT ON REAR PANEL).

2: ON IC 2, CONNECT FOLLOWING PINS TOGETHER: (1,5,12), (2,9), (11,4) (8,13,10), (6,3).

Fig. 4

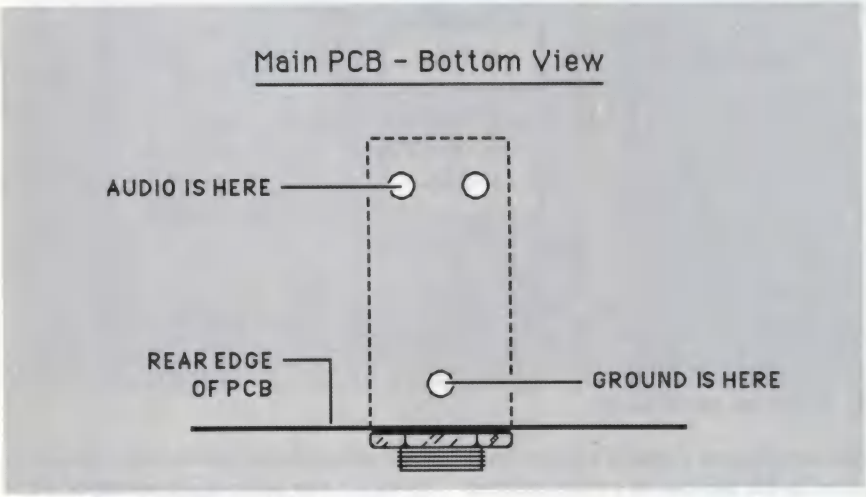

Main PCB - Bottom View
AUDIO IS HERE
REAR EDGE OF PCB
GROUND IS HERE

Fig. 5 *Channel 1-6 output jack (bottom view)*

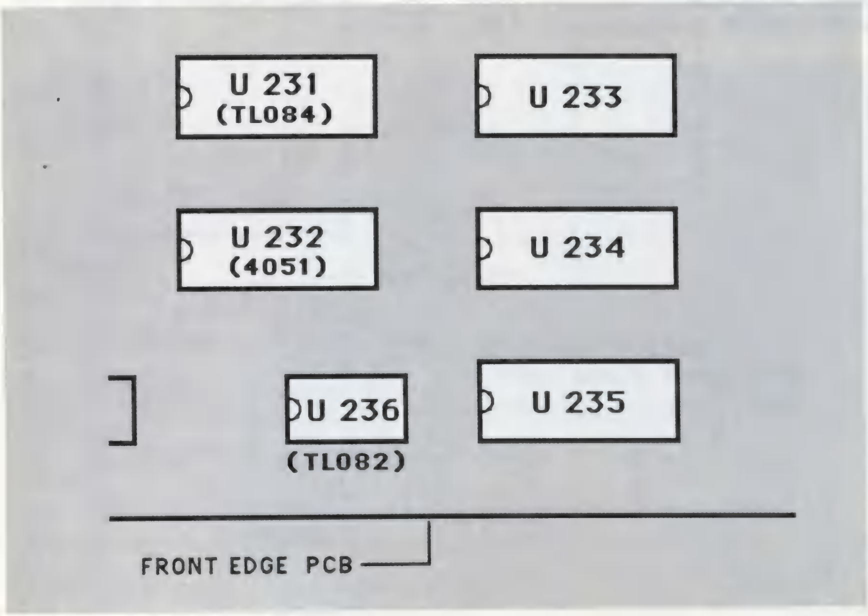

U 231 (TL084)
U 233
U 232 (4051)
U 234
U 236 (TL082)
U 235
FRONT EDGE PCB

Fig. 6

Build the circuit in **Fig. 4** on a piece of perf board. Use sockets for the ICs and 1/4 watt 5 percent resistors throughout. **Fig. 3** shows where to tap the +5 Volt and ground connections required by this circuit, and **Fig. 5** shows how to tap the channel audio output that connects to R3 (the 33k resistor in **Fig. 4**).

To get at the bottom of the printed circuit board, remove the six screws holding it down, back out the three black screws holding the right side wood panel on, then carefully pull the board up and out by the front edge—pull the AC power plug first, and be careful not to touch the lithium battery circuitry on the front left to the case edge! The comparator + input goes to U231 (a TL084 op amp), pin 1, to tap off of tom channel 3. This circuit can be used on other channels, too; for channel 1, the + input goes to U231 pin 14, channel 2 goes to U231 pin 8, channel 4 uses U231 pin 7, channel 5 uses U236 (a TL082) pin 7, and channel 6 uses U236 pin 1. **Fig. 6** shows how these ICs are grouped together on the circuit board.

The two new audio outputs should be panned to opposite sides of your stereo mix. This circuit produces a slight click in one output when the drum sound plays through the other output; this click is very low-level, and impossible to detect in the stereo mix. If distortion occurs when this circuit is used on other channels besides the toms, try substituting a 3k3 or lower value resistor for R4.

Now you can make your snares rumble and your toms roll...so grab that soldering iron and give your DrumTraks some new tricks.

EM

When you run out of hands, use your head—and build something that lets you use your feet.

The Program Stepper

BY MARK M. WILLIAMS

A musician friend of mine needed to change programs in his Korg Poly 800 without taking his hands off of his other keyboards. Before this circuit, he had to reach to the numeric keypad of the Poly 800 and enter a three-key sequence to go to another program. Now, by using the Program Stepper, making a program change—or "stepping" through consecutive programs—is only a footswitch away.

***Mark Williams** has been involved in music since 1975. He holds degrees in electronic and computer hardware from Memphis State University, where he is currently an instructor in the Electronic Technology department. His other activities include advising local musicians on technical problems, and performing with a Memphis church group.*

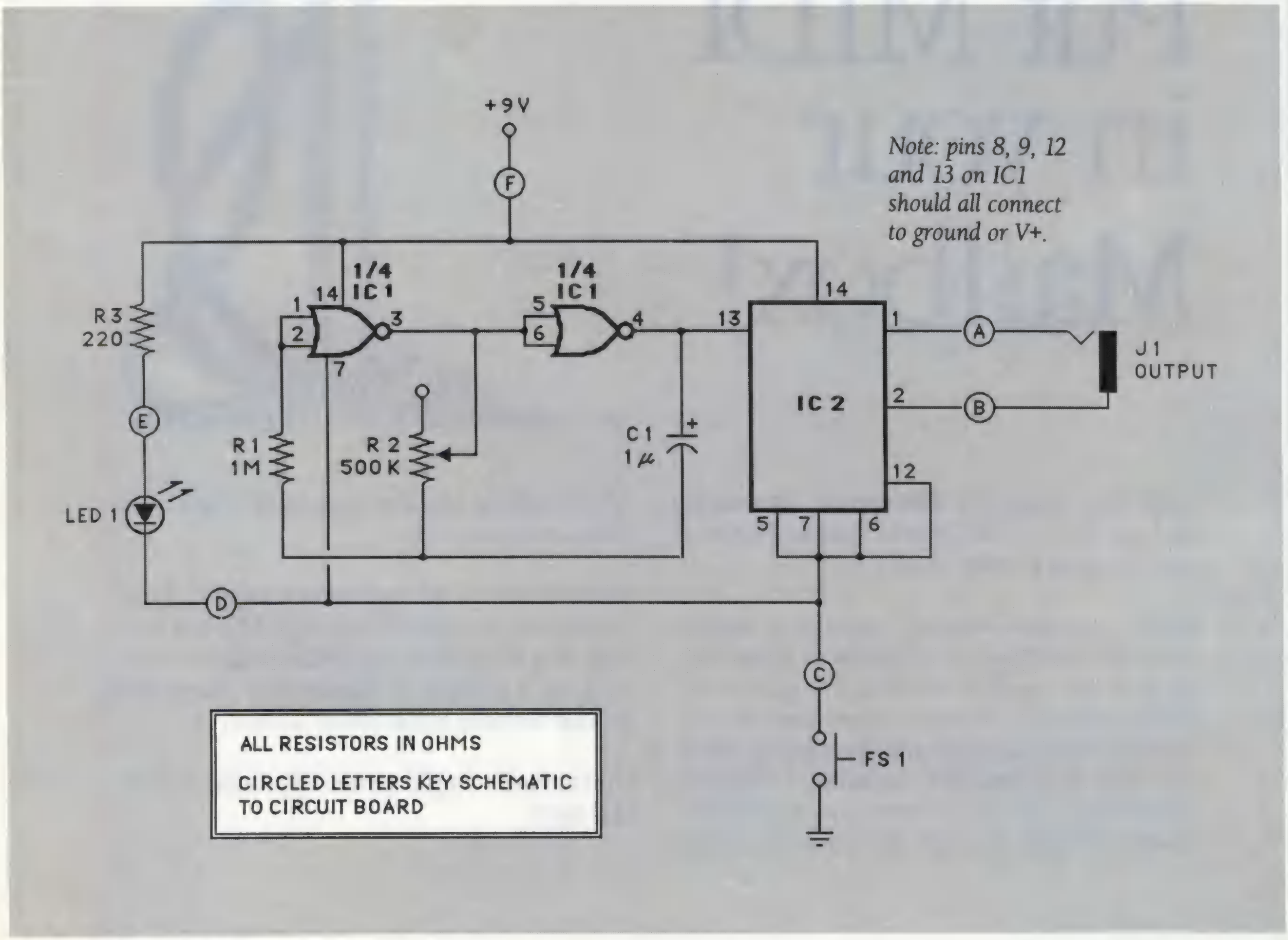
HOW IT WORKS

Fig. 1 shows the Program Stepper. The heart of the circuit, a CMOS Quad 2-input NOR gate (CD4001), forms an astable multivibrator (oscillator)*. R2 and C1 determine the rate (frequency) of the pulses appearing at the oscillator output. Trimpot R2 varies the output waveform frequency. The output pulses then feed a CMOS Quad bilateral switch (CD4066). When the oscillator output goes high, the switch closes, and when it goes low, the switch opens. Resistor R1 reduces variations in frequency with variations in supply voltage and its value does not affect the output frequency.

The output is directly compatible with the Program Up jack located on the rear panel of the Poly 800. Shorting the two leads of this jack advances the current program to the next highest numbered program. The multivibrator will automatically advance programs at a rate comparable to its frequency of oscillation as long as the footswitch (FS1) is held closed, or the programs will advance one at a time if you give a single tap to the footswitch. LED1 in conjunction with R3 indicates when the unit is turned on. The entire unit is switched on via the footswitch to save on batteries; power is applied only when needed.

CONSTRUCTION

All components shown in the parts list are easy to find (check your local Radio Shack). **Fig. 2** shows the artwork for a

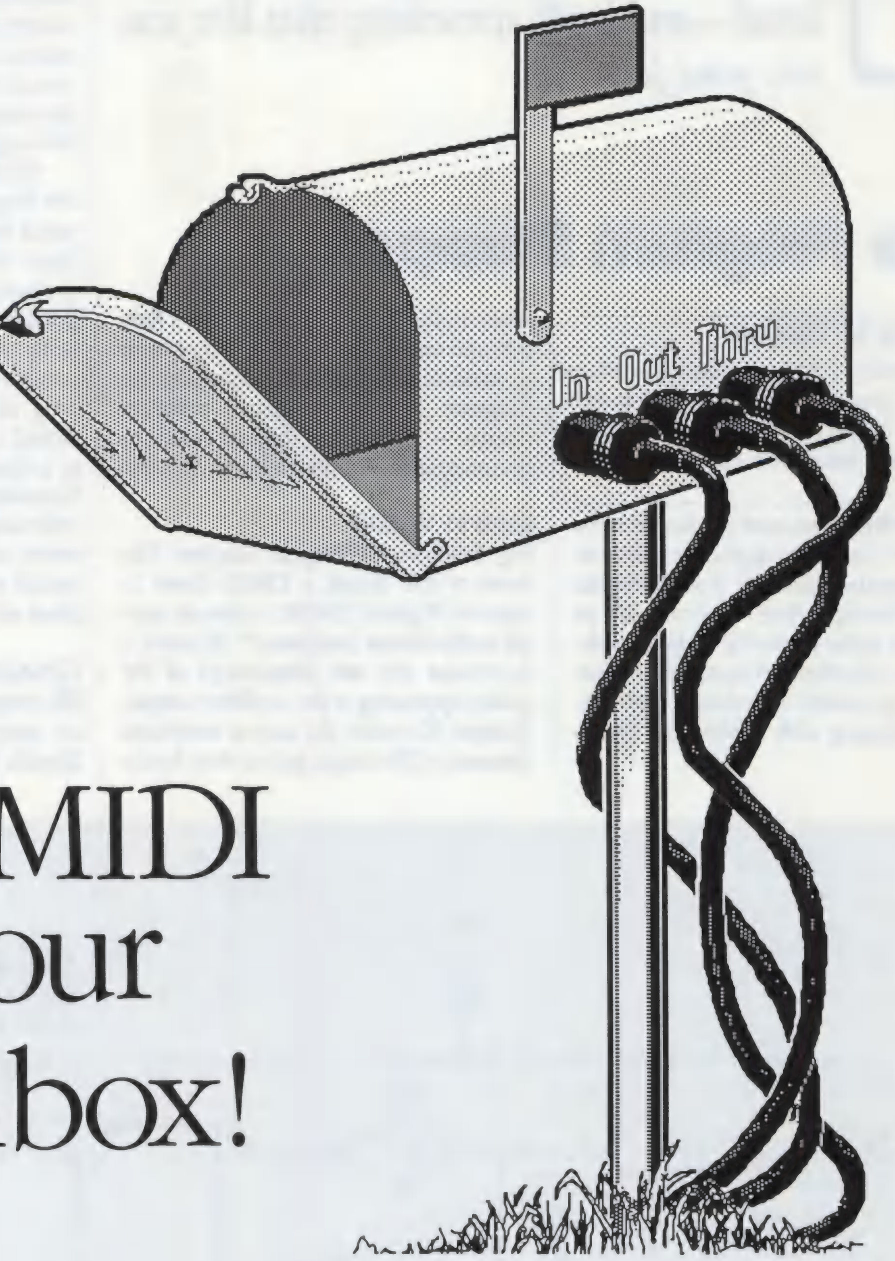


Note: pins 8, 9, 12 and 13 on IC1 should all connect to ground or V+.

ALL RESISTORS IN OHMS

CIRCLED LETTERS KEY SCHEMATIC TO CIRCUIT BOARD

Fig. 1: *Program Stepper*



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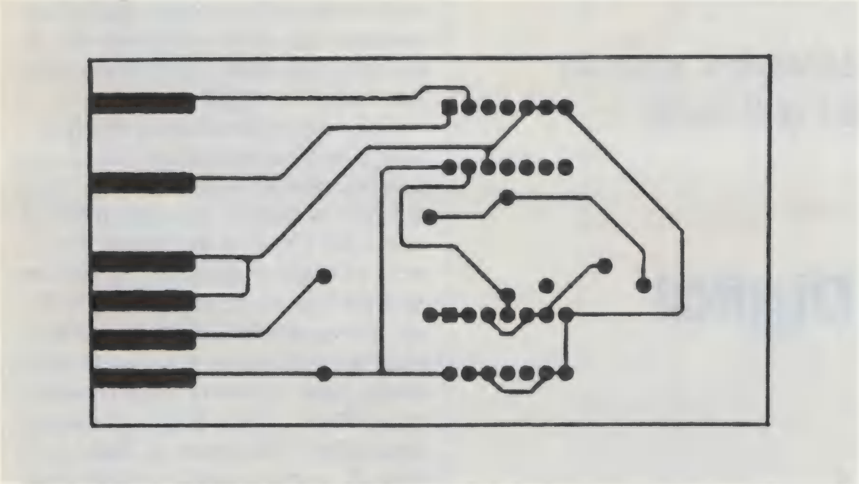

Fig. 2

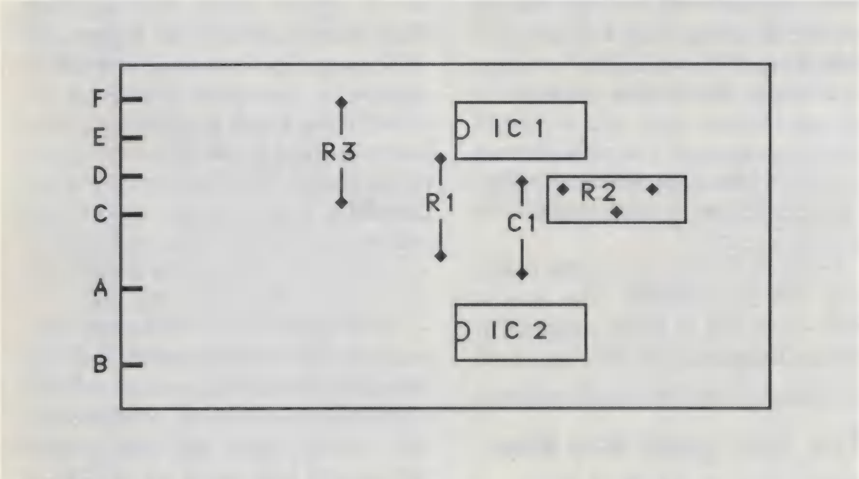

Fig. 3: *PC Board Component Layout*

PARTS LIST

Resistors

R1	1M
R2	500K PC-mount trim pot
R3	220 Ohms

Capacitors

C1	1μF electrolytic

Semiconductors

LED1	LED, any available type and color
IC1	CD4001
IC2	CD4066

Mechanical Parts

FS1	Rugged, SPST momentary contact pushbutton switch
J1	¼-inch open-circuit phone jack
Misc.	Suitable enclosure, edge-card connector, battery, battery holder, IC socket (14 pin), wire, solder, hardware, etc.

printed circuit board; the circuit board plugs into an edge card connector to facilitate trouble-shooting (if required). **Fig. 3** shows the circuit board parts placement guide—don't forget to use sockets for the ICs.

I used a small, sloped front BUD enclosure. The top of the case holds the footswitch and the LED while the rear panel provides mounting for the output jack and a screwdriver hole for adjusting R1. Keep in mind that the enclosure must be strong enough to withstand being stepped on repeatedly by its user.

USE

Connect a patch cord between the Program Stepper output jack and the Poly 800 Program Up jack. (Incidentally, many other synths have the same type of program change jack; check the back panel.) Press the footswitch and, using a small, flat-blade screwdriver, adjust R2 until the programs change at a reasonable rate. Now, by holding the footswitch down, the programs will continue to step through the entire memory. Also, by tapping the footswitch, the programs will increment one at a time. Use this method when you get close to the desired program.

AFTERTHOUGHT

If you have the Bank Hold of the Poly 800 on, the Program Stepper will still continue to step through all programs. It will not turn the Bank Hold off. Using this feature, you can quickly go from one bank to the next with the footswitch and change programs within a bank by entering a two-key sequence on the numeric keypad.

That's it; a simple, battery-operated device that will put one of your feet to good use while eliminating the need to be lightning quick with your hands. I hope this circuit will prove to be as useful to you as it is to the person for whom it was designed. So quit standing; get stepping!

---

*For an excellent reference on multivibrators, see Chapter 4 of the *CMOS Cookbook* by Don Lancaster; available from MIX Bookshelf, 2608 Ninth St., Berkeley, CA 94710 for $14.95 plus $3 for shipping. This book is a *must* for anyone working with CMOS parts and digital logic design.

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It's a fascinating instrument with an incredible sound. But is it really a substitute piano?

Roland MKS-20 Digital Piano Module

BY FREFF

Step right up, folks, and meet a Wonder and a Mystery!

At last fall's Audio Engineering Society (AES) show in New York, the Big Hit was unquestionably Roland's new digital piano module. Still in prototype form, not due to be shipped for months, the MKS-20 was more than a little mind-boggling: for in this innocuous 19-inch rack-mounted box (a mere 3.5 inches tall and 17 pounds heavy) there lurked a really good piano sound. And I mean *really* good. I heard it for myself. *Everybody* heard it. Even now it is difficult to describe exactly how strange and magical it felt when the Roland demonstrator referred to the instrument's three piano presets as "Steinway, Steinway with lacquered hammers, and Bosendorfer". . . and then backed up his bold words with equally bold timbres!

Exciting stuff. If the MKS-20 prototype could sound that good despite appalling hotel room acoustics and a semi-pro PA, the final product promised to be truly *devastating*.

The curious thing is: it isn't what I expected. Not that it isn't good; let's set that part of the record straight at the beginning. The MKS-20 is a fine piece of gear. As you'll read shortly, it offers a lot of punch for the bucks. I have recorded with it, will record with it again, and am extremely impressed by it. But I'm not as impressed by it as I was, and that particular peculiarity is driving me to distraction. Did the MKS-20 change. . . or did I?

***Freff** lives in Brooklyn with three friends, three cats, seven computers, and a recording studio. Aside from drowning in article deadlines, he writes documentation for synths and software, is the American reporter for a BBC show about computers, and is working on various book and record projects.*

THE BOX

What we have here is a 16 voice, polyphonic, dedicated MIDI module, offering a specific set of tone colors to add to your palette of available sounds. The front panel is a simple, almost stark, testament to both operational ease and a limited choice of parameters. The MKS-20 is not any kind of heavily-programmable digital synthesizer per se, and shouldn't be mistaken for such.

Let's look the box over briefly, before going into deeper detail. The back is simple—two sets of stereo outputs (¼-inch and balanced XLR), an output level switch, MIDI In and MIDI Thru jacks, and a plug for the don't-lose-it-because-nobody-else's-is-anything-like-it Roland power cable. The front panel, however, reveals considerably more of the MKS-20's character. From left to right you'll find:

> *"The front panel is a simple, almost stark, testament to both operational ease and a limited choice of parameters"*

✓ Earphone jack, Tune button, LCD contrast knob, and master volume fader. These are pretty standard, though I appreciate the contrast knob (which alleviates the LCD angle-of-visibility problems caused by typical rack placement) and the resolution of the Tune control. The range of tuning could be wider—it sets concert A to any 0.1 Hz increment between 438 and 446 Hz—but Roland gets points for convenience, especially the way the unit temporarily shuts off any chorus or tremolo effects that might confuse accurate tuning. Here, also, you meet the first of several "hidden" functions, an octave shift that lets you use other keys to transpose the entire instrument one or two octaves in either direction when the Tune button is toggled on.

✓ Eight buttons for selecting which preset to play. The terminology Roland uses here is a tad confusing. They have eight different variations on eight different voices, for a total of 64 presets. But instead of organizing each voice and its variations into single, separate banks, for easy access, they've filled each bank with a new set of variations on the lot. In other words, bank 1 has the eight available voices (Piano 1, Piano 2, Piano 3, Harpsichord, Clavi, Vibraphone, E. Piano 1, E. Piano 2); so does bank 2, but with some parameter changes; likewise bank 3; likewise bank 4; and so on. It's a backward way to organize things, akin to putting filing cabinets inside of file folders, and while you get used to it, there is always an element of conceptual gymnastics involved. It also means you have to do extra button-pushing to call up the exact preset of your choice. This is admittedly a minor complaint. It gains greater prominence only because Roland did so well with the rest of the user interface that it makes me wonder how they missed this one.

✓ Another set of six control buttons, their purposes fairly evident from their names. Write and Save pressed together will save a bank of 64 presets to an external memory cartridge. Write and Load pressed together will load a new set in. Bank is what you press, together with one of the number keys, to get to a specific variation on one of the preset voices. Chorus and Tremolo turn those built-in effects on and off; each button has an indicator light that comes on when its effect is active.

✓ The set of controls for which Roland deserves the most applause: two buttons, a stack of LEDs, and a rotating dial that make preset editing a snap. The two buttons select which mode you are in, Function or Edit. While in Function mode, spinning the dial—easy, given its fingertip indent—steps the LCD and LED stack through the 11 available parameters. Once you see the parameter you want to alter, simply press Edit and spin the dial again (in Edit mode the dial changes parameter values, not parameters). What could be simpler, or more intuitive? The only thing to remember is that the original sounds in Bank 1 are inviolate (i.e., all changes you make to them are temporary and will vanish when power is shut off) *but the sounds in banks 2-8 are not.* Anything you do to them stays in battery-backed memory—so when you find a setting you like, write it down so that you can reconstruct it later if you need to. The available parameters are few and simple, so this shouldn't be a hardship.

✓ Memory cartridge slot, Power switch, and a green MIDI Message indicator that lights up when the MKS-20 is receiving MIDI data. While the LED is useful to verify that your master keyboard is putting out MIDI data on the desired channel and the MIDI cord is connected properly, I think the main purpose is to add some flash (literally) to the front panel. Not that this is intrinsically bad: one of the sneaky joys of recording is feeling like you're on the bridge of the Enterprise, and so I'm all in favor of the occasional gratuitous blinky light. In fact, the more the merrier! (I once considered manufacturing a line of cosmetic studio gear with incredibly mind-blowing, magnificent, meaningless displays and no audio content. But MTV beat me to it.)

SOUNDS AND FEATURES

At the AES show, the promo for the MKS-20 made extensive reference to a process Roland called "Structured Adaptive Synthesis." They wouldn't explain it in any detail, so what I'm about to say is perforce half reasonable analysis and half educated extrapolation.

What *appears* to be going on is that Roland has made extensive harmonic analyses of a variety of keyboards, mapping the amplitude and pitch variations of the partials over time and at different volumes, then figured out which features of these maps were most important (or most common to the class of instruments being examined), and finally concocted additive synthesis algorithms to "recreate" the important features of these complex sounds out of digitally-generated sine waves. It isn't sampling, which plays back an invariant digital recording of a source sound, subject to some minor signal processing. And it isn't FM synthesis (the lack of an artificial, "sheeny" quality in the upper registers of any of the presets makes that instantly clear), where sine waves are fed into one another, thus creating harmonic variation through modulation. Instead the MKS-20 appears to be an attempt at real time (though limited) additive synthesis...or, as it is called when based so deliberately on an existing sound model, "resynthesis." This is not an easy task, by any means. I'm not surprised that in its first instrument of this type, Roland would keep hardware and software costs down by cutting back on flexibility. The sounds are all percussive metallophones, indicating only a few—possibly even only one—basic sound model. Further, my timbre-versus-volume tests indicate that the sine waves change in amplitude over time but not in pitch, thus cutting into the realism of the created sound. The MKS-20 seems to rely more on processing power than on the brute force of extensive memory, and a look inside the box confirms it: a number of interesting processors, more than one marked with Roland's names and codes (thus giving away very little to an outsider), but none of the ranks of ROMs or EPROMs typical of instruments that draw heavily on samples.

The result is an instrument that beats out sample-based digital pianos in one way (smoothly blending timbres across the width and velocity-range of a MIDI keyboard, without apparent breakpoints) but lacks the sampler's particular quality of realism. The sounds are *like* the sources they are modeled after in much the same manner that a photograph is like the real thing. Both are vivid illusions, but lack dimension. Roland compensates for this by adding programmable equalization (EQ) and built-in chorus and tremolo circuits. Proper EQ is essential, but after some experience trying to record the MKS-20, I'd say that the onboard EQ (with its fixed 10 kHz treble, parametric middle, and fixed 100 Hz bass filters) is no more than a decent start. More often than not I've left it flat, or tweaked only mildly, and tackled the problem with the workhorse parametric equalizers in the rack. A vaguely "aliased" noise is the chief culprit, followed by an excessive brightness of tone, and what you need to do to tame them varies with choice of preset and pitch range. On the plus side, Roland should take bows for the chorus and tremolo, both of which sound great. Turning one or both on at extremely low settings greatly "naturalizes" the sound. There isn't actual harmonic beating, like in a real piano, but in pop mixes nobody will notice.

Piano 1 and Piano 2 are fun to work with, with 2 a little brighter and harder than 1. Piano 3 isn't the "Bosendorfer" sound anymore. Roland has replaced it with an attempt at an electric grand sound, but one that is harsher than I would like. The Harpsichord sound is really weird in that it completely lacks the pluck-on-release sound that identifies a harpsichord sound (another indicator of cost-cutting, or perhaps an intrinsic limitation of this particular approach to resynthesis). Clavi is an interesting sound in its own right, but is definitely not an ersatz clavichord or clavinet (hence, perhaps, the truncated name). Vibraphone

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is great, superior to any basic vibes sound I have heard short of the actual thing—and no whirring motors to mar the effect. E. Piano 1 and E. Piano 2 I won't comment on, aside from saying they record credibly and will please people who, unlike me, have not been bored to tears by that bland sine-and-tine sound.

The banks offer relatively little (and relatively predictable) variation, because there just isn't that much you can do. Adjust the EQ some, adjust the tremolo some, adjust the chorus some. That's it. If you aren't turned on by the preset sounds, you will not find miraculously different versions among the other 56 programs.

Certain bank features are quite useful, however, and do deserve comment. First and best is that each preset can have its own tailored volume level, allowing you to avoid nasty surprises as you change from one to another. Another is the Voice Preserve function, which lets you change from one voice to another, using MIDI program change commands, without altering the voice selection of notes that are still ringing thanks to depressed keys or the sustain pedal. Unfortunately, this doesn't work with changes made from the front panel itself, only those transmitted through MIDI, but it's a considerate touch.

THE MKS-20 AND MIDI

The MIDI implementation is fairly limited. The MKS-20 does not respond to aftertouch or modulation data, will interpret foot control and expression codes (but treats them strictly as volume controls), and will accept trigger commands to turn on the chorus and tremolo but not to alter their rates or depths. Omni and Poly modes are both supported; multitimbral operation is not. There's room for considerable improvement in MIDI-controlled expressiveness, if Roland's resynthesis architecture will allow it.

TWO CAUTIONS ABOUT THE MKS-20 AND MEMORY CARTRIDGES

According to the manual, loading or removing a memory cartridge that is *not* set to Memory Protect might screw up the cartridge's memory. This is not a good thing, so take no chances. On the other hand, the MKS-20 offers so few parameters and can be edited so quickly, I find it difficult to imagine you'll ever need a memory cartridge . . . so the concern may be moot.

SO DID THE SOUND CHANGE? OR DIDN'T IT?

Good questions. At this year's summer NAMM show in Chicago, the Roland folks were most insistent that no significant changes had been made between the prototype model I'd heard last fall and the production model. And yet I still hear differences, and so do some other professional users with whom I've discussed this.

I'm willing to believe it's a matter of strong first impression versus detailed examination, abetted by the high frequency rolloffs created by a mid-fi PA and a crowded hotel room. Maybe it sounded better then because the things that I'm hearing now, the things that bother me, were accidentally masked. However, I have seen many instruments travel the road from prototype to production, and there are always adjustments and changes. Parts that were available become unavailable, and substitutes must be used. Other parts are made obsolete and replaced by new versions. Functions that were the province of several chips are compacted down onto one. Manufacturing changes. Raw materials change. And software *always* mutates (it's an inevitability right up there with the Second Law of Thermodynamics). So I would be highly surprised if the MKS-20 magically avoided the perils of this process. It could be that the EQ circuitry is subtly different. It could be that Roland changed the digital filters or the DACs. Or is it, as they say, all in my head?

> *"Vibraphone is great, superior to any basic vibes sound I have heard short of the actual thing—and no whirring motors to mar the effect"*

Thank heavens the bottom line is simpler than that. The MKS-20 is the first instrument on the market to take an affordable swing at additive resynthesis. If I'd come on the unit cold, instead of with these ineradicable AES memories, I would not be debating "before" and "after": instead I'd be raving about its sound and low price.

So, taken all in all, Roland has produced a winner. And with the next generation of this technology—revved up with further analysis, more memory, and greater processing power—Roland might very well give birth to a star. EM

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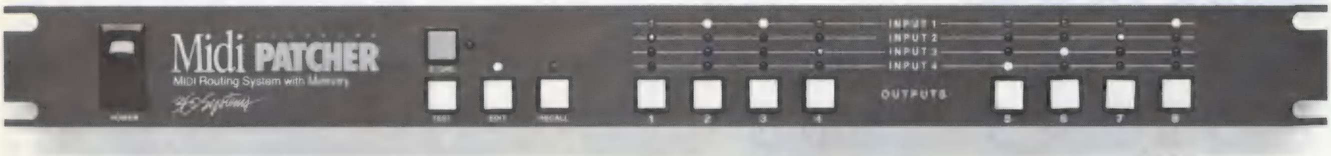

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Did someone say "MIDI sequencers?" In one person's opinion, we're just starting to scratch the surface.

Mark of the Unicorn's "Performer"

Beyond Tape Simulations

BY **KIRK AUSTIN**

It seems like MIDI recorders (sequencers) improve with each passing month. What was only a dream a few short years ago is now taken for granted. But, I guess there's always room for improvement (someone once told me that it's the world's largest room).

Consider the present state of MIDI recorders. We can now record notes, program changes, continuous controller data, and more—then edit this information until it is acceptable, and print it out as music notation. We can also store and edit "patches" from our synthesizers, and create huge libraries of sounds on floppy disks. This last function is one I just could not be without; I have spent hours with Opcode's DX7 editor/librarian and had a lot of fun.

What we need, though, is an *integrated* program—one that handles MIDI recording, notation, and patch editing/librarian functions. While I can do all of these things now, I have to swap disks a lot (complain, complain, complain). I would also like features that are beyond the capabilities of today's software, such as being able to enter the notes of a particular piece and then go back and enter the rhythm. Let me explain this a bit more in order to describe what I want to accomplish. In most musical performances the composer establishes the actual sequence of notes, but the performer develops the rhythmic "feel." By "feel," I mean the rhythmic anticipations and delays produced by reading between the lines of a musical score. A musical score is just an approximation of what is actually played; there are subtle rhythmic variations in any virtuoso performance that cannot be easily notated in a conventional score. These are the subtle nuances that I would like to be able to factor into a MIDI performance.

If I could first enter the notes for a particular part by playing the synth keyboard, then go back and enter only the rhythm by striking any key on the keyboard and recording only the timing information, I could concentrate fully on the rhythmic "feel" of the piece. I could even enter the rhythmic information from a MIDI drum pad using a stick. This would be great! No company has addressed these kind of advanced features as far as I know. We still have a lot of room for improvement.

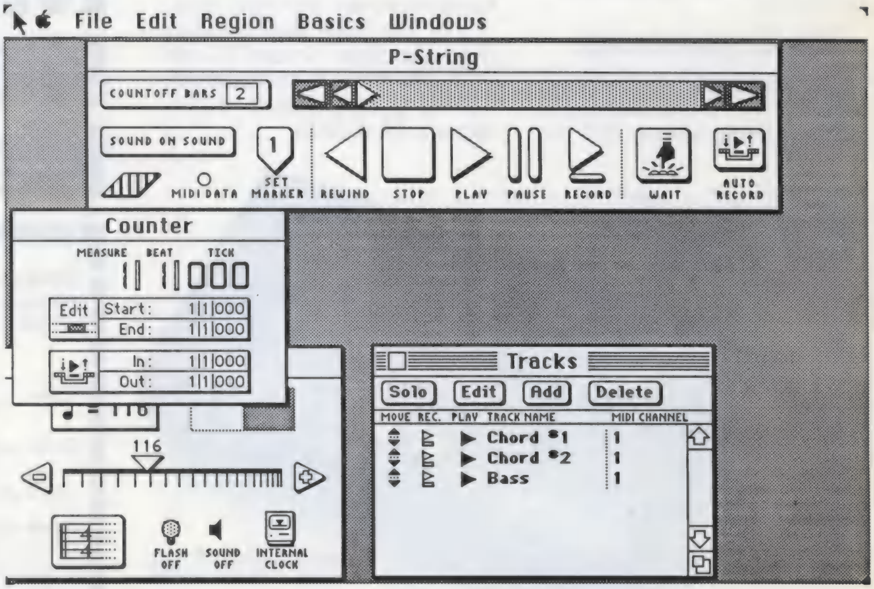
Now, I should mention that the aforementioned idea is not originally mine, but Max Matthews', a researcher at Bell Labs. It's not as if this idea hasn't been around for very long; it just hasn't been implemented in a commercial product yet, as far as I know. Meanwhile, let's look at a program that does do some new and interesting tricks.

PERFORMER

The latest MIDI recorder that has found its way into my studio is Performer by Mark of the Unicorn. It's a MIDI recorder that runs on the Macintosh computer, and when used in conjunction with Professional Composer (also by Mark of the Unicorn; see **EM**, March 1986 for the review of Professional Composer), it allows you to do transcription as well. If you aren't interested in notation, but just want a good quality MIDI recorder, Performer by itself is an excellent choice. The list price is $295, and the program works with every available MIDI interface that I know of for the Macintosh (including the one made by my company, Austin Development). The documentation is very good, and the program itself is aesthetically well presented (**Fig. 1**). Anyone familiar with a multi-track tape recorder should be able to start using Performer for useful work without ever consulting the manual. Once you do start looking into the manual, though, you will find that this program does much more than just emulate a tape recorder.

FEATURES

One of the outstanding features is selective quantization. You can quantize a single bar if you want to instead of having to quantize the entire track—so now you can fix one bad note in an otherwise acceptable performance. In addition, there is a parameter that I refer to as the



COUNTOFF BARS 2

MEASURE BEAT TICK 1 1 000

Edit Start: 1|1|000
End: 1|1|000
In: 1|1|000
Out: 1|1|000

MOVE	REC.	PLAY	TRACK NAME	MIDI CHANNEL
		▶	Chord *1	1
		▶	Chord *2	1
		▶	Bass	1

Fig. 1

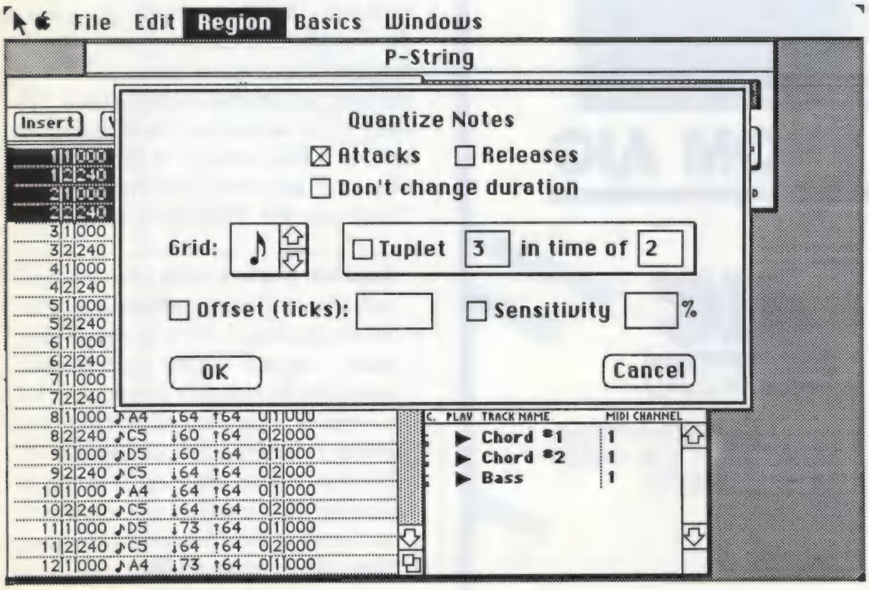
***Kirk Austin** designed one of the first standalone MIDI keyboard controllers. He is employed as an assembly language programmer for an industrial controls company and creates much software for the Mac. In addition to writing for* **EM**, *he also contributes to several Macintosh magazines.*

"slop factor" in quantizing (**Fig. 2**). Mark of the Unicorn refers to this as the quantizing sensitivity (a much less colorful term). At any rate, you can enter a number of "ticks" to which the program will round off. That is, if you only want it to quantize notes that are 300 ticks off beat, you can set the sensitivity to only quantize those notes. You can also offset the quantized notes so that they are actually placed ahead or behind the beat. I used to never use quantizing, but with the flexibility of this program, I have started using it (albeit very selectively).

Other fun things include picking apart previously recorded material. If I play a track of three-note chords, I can divide that track into three separate tracks by using the "Split Notes" function. This is really a timesaver; I can play the three-note chords while recording the track, but once divided I can edit each new track separately. Thus, individual notes can be quantized without necessarily quantizing all three notes in the chord. I can also even out the velocity of one particular part, or do something like send only the top note to two MIDI channels to double the melody. . . or double the bass part. This "Split Notes" feature is very advanced, and it takes some time to really get a feel for how powerful it is, but the time is well spent.

The most exciting use of Performer is to use it in conjunction with Professional Composer to do visual editing via standard music notation. Since I have a Macintosh Plus computer I can have both programs loaded under a utility called "Switcher" (a readily available software program often a part of other software packages) and instantly switch back and forth between the two. This is almost as good as having one integrated program that does both sequencing and notation, but you have to have at least one megabyte of memory to do it. Files created by Performer can be saved in Professional Composer format so that you can have your synth keyboard performances transcribed automatically! And, the best part about it is that it actually works!! Other programs have promised this kind of operation, but the combination of Performer and Professional Composer is the cleanest implementation I have used so far. I can enter a track in Performer, save it, then use Switcher to go into Composer, and visually edit the resulting music notation (including dynamic markings, staccato/legato indicators, and crescendos), then switch back into Performer and play back the results. It's fantastic!! Approaching it from the other direction, I can compose music in Professional Composer and play it through the Mac speaker to verify my note entry, then when I am done with the piece, open the file with Performer and play the music back via MIDI. This makes it easy to compose music away from the synth keyboard.

Performer allows you to do editing in a numerical format that is very useful in itself (**Fig. 3**). The resolution is 480 ticks per quarter note (the finest resolution I have seen), and after a while it is pretty easy to relate the numbers to note durations. When you see the number 240, you know that it refers to an eighth note, 120 means a 16th note, etc. Performer also records system exclusive data, so you can record parameters such as DX7 function data. You can also enter continous con-



Quantize Notes

☒ Attacks ☐ Releases

☐ Don't change duration

Grid: ♪

☐ Tuplet 3 in time of 2

☐ Offset (ticks): ☐ Sensitivity %

```
 1|1|000
 1|2|240
 2|1|000
 2|2|240
 3|1|000
 3|2|240
 4|1|000
 4|2|240
 5|1|000
 5|2|240
 6|1|000
 6|2|240
 7|1|000
 7|2|240
 8|1|000 ♪A4  ↓64 ↑64  0|1|000
 8|2|240 ♪C5  ↓60 ↑64  0|2|000
 9|1|000 ♪D5  ↓60 ↑64  0|1|000
 9|2|240 ♪C5  ↓64 ↑64  0|2|000
10|1|000 ♪A4  ↓64 ↑64  0|1|000
10|2|240 ♪C5  ↓64 ↑64  0|2|000
11|1|000 ♪D5  ↓73 ↑64  0|1|000
11|2|240 ♪C5  ↓64 ↑64  0|2|000
12|1|000 ♪A4  ↓73 ↑64  0|1|000
```

```
C. PLAY TRACK NAME   MIDI CHANNEL
   ▶ Chord #1        1
   ▶ Chord #2        1
   ▶ Bass            1
```

Fig. 2

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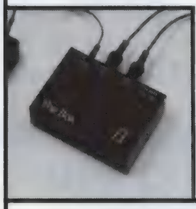

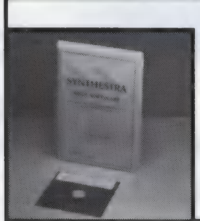

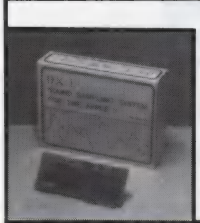

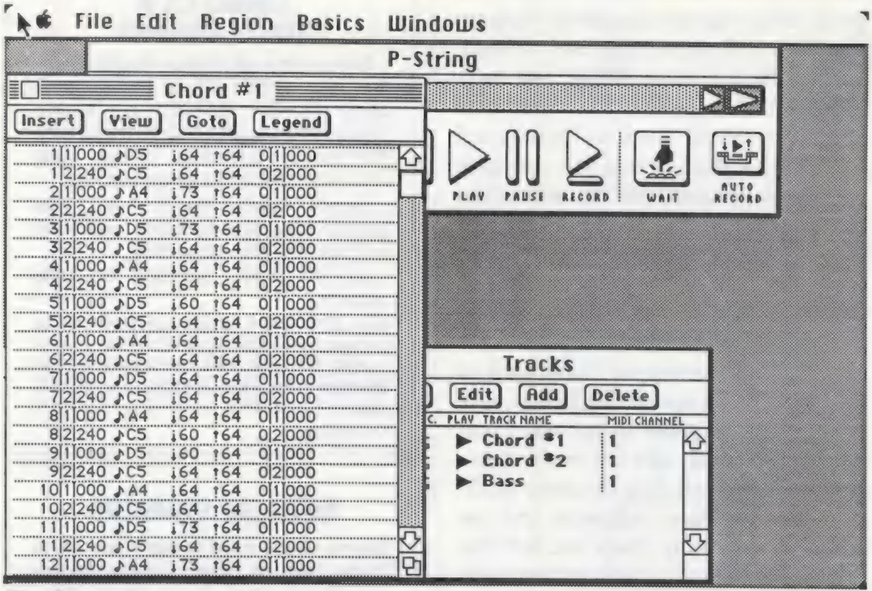

```
 1|1|000 ♪D5   ↓64  ↑64   0|1|000
 1|2|240 ♪C5   ↓64  ↑64   0|2|000
 2|1|000 ♪A4   ↓73  ↑64   0|1|000
 2|2|240 ♪C5   ↓64  ↑64   0|2|000
 3|1|000 ♪D5   ↓73  ↑64   0|1|000
 3|2|240 ♪C5   ↓64  ↑64   0|2|000
 4|1|000 ♪A4   ↓64  ↑64   0|1|000
 4|2|240 ♪C5   ↓64  ↑64   0|2|000
 5|1|000 ♪D5   ↓60  ↑64   0|1|000
 5|2|240 ♪C5   ↓64  ↑64   0|2|000
 6|1|000 ♪A4   ↓64  ↑64   0|1|000
 6|2|240 ♪C5   ↓64  ↑64   0|2|000
 7|1|000 ♪D5   ↓64  ↑64   0|1|000
 7|2|240 ♪C5   ↓64  ↑64   0|2|000
 8|1|000 ♪A4   ↓64  ↑64   0|1|000
 8|2|240 ♪C5   ↓60  ↑64   0|2|000
 9|1|000 ♪D5   ↓60  ↑64   0|1|000
 9|2|240 ♪C5   ↓64  ↑64   0|2|000
10|1|000 ♪A4   ↓64  ↑64   0|1|000
10|2|240 ♪C5   ↓64  ↑64   0|2|000
11|1|000 ♪D5   ↓73  ↑64   0|1|000
11|2|240 ♪C5   ↓64  ↑64   0|2|000
12|1|000 ♪A4   ↓73  ↑64   0|1|000
```

TRACK NAME	MIDI CHANNEL
▶ Chord #1	1
▶ Chord #2	1
▶ Bass	1

Fig. 3

troller data (such as mod wheel or aftertouch) directly from the Macintosh keyboard by entering a start point and an end point, a beginning level and an ending level, and the curve that you want the controller to follow. This feature allows you to do things like fadeouts at the end of a song or smooth filter sweeps on an analog synth.

Another handy Performer feature is the incorporation of "Markers" in a sequence. This is kind of the MIDI equivalent to autolocation points on tape machines. For instance, by setting markers at the beginning of each verse and chorus you can instantly jump to those points for editing purposes or for punching in. Speaking of punching in, it is really easy to do this particular technique. To rehearse, you can just play the music and click the mouse button on "Punch In" when you want the computer to punch in, and likewise click on "Punch Out" to stop recording. When you start playing the music, Performer automatically performs the punch in and punch out for you. What could be easier?

CONCLUSIONS

I have been having a lot of fun with this program (and isn't that what it's all about?), but there are a few things that I wish it could do that it doesn't. For one thing, I have gotten hooked on the visual editing style of programs like Total Music, which present the notes as a sideways player piano roll. This approach is extremely easy to get used to, and is also very fast. It would also be nice if Performer recorded tempo changes. You can use an external timing source (as long as it sends out a MIDI clock) for the program, though, so there is a solution. All things considered, I have to say that Mark of the Unicorn's Performer has become my MIDI recorder of choice (until the next thing comes along), and I would highly recommend it to anyone considering a stand-alone program for the Macintosh. EM

—from page 34, TELECOMMUNICATIONS

talk. We tried submitting questions to him over the modem but he preferred an in-person or telephone interview. He sent us messages from Los Angeles, New York, Australia, or wherever he happened to be. But the story was always the same: no interview until he was ready. By the time we completed the book, we still had not spoken to Walsh in person. That's when the thought of a foreword came up. We dropped him another message, he loved the idea, and started working on it right away. A few weeks later, he electronically sent us a final version of his foreword, which is now included in the book. Thank you, Joe. Thank you, modem.

Benjamin Krepack *writes for a variety of computer and music publications. As a freelance technical writer, he creates user guides, computer system manuals, and newsletters for high-tech corporations; he is currently under contract with the Corporate Documentation department of American Honda. When not at his home computer, he's usually stuck somewhere on a Los Angeles freeway blasting the new Stones album at top volume.*

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It conquered the world of professional keyboards. Will FM synthesis now become the darling of low-end keyboards as well?

Affordable FM: The DX100

BY CHARLES WILLIAMSON

The DX100 is a portable, battery-powered addition to Yamaha's growing DX family of FM algorithm synthesizers. Thanks to its inexpensive price ($449 list), the DX100 lends itself to comparison with not only the venerated DX7 but also Casio's CZ-101.

Dx Fm Synthesis

First, here's a quick primer on FM synthesizer basics. The timbre of a VCO (*carrier oscillator*) can be changed by driving its input with a second oscillator, called a *modulator*. The character of the timbre depends mostly on the *amplitude* of the modulating oscillator and the *frequency ratio* of the two. To change the timbre over time, we can use an envelope generator to affect either the modulator's frequency or output level.

DX instruments have an envelope generator permanently attached to each oscillator's output. A typical voice patch might open the envelope and pass a lot of modulator into the carrier oscillator (the one you hear) when the key is first pressed, and then taper the modulation amplitude off quickly. This would provide the initial burst of overtones common to the sound of objects being plucked or hit. Generally no filters are used or needed in FM synthesis.

The DX approach bundles an oscillator, with an envelope generator controlling its output level, into a package called an *operator*. The DX7 has six operators available for programming; the DX100 has four. Each of the operators can be used as a modulator or a carrier, so there are several possible ways to interconnect them. The DX100 provides eight different normalized connections, called *algorithms*, that cover just about every musically useful way to interconnect the four operators. The DX7, with its six operators, has 32 algorithms available.

> *"The DX100 lends itself to comparison with not only the venerated DX7 but also Casio's CZ-101"*

Physically, the DX100 is wedge-shaped with two rows of little rectangular rubbery buttons (unlike the DX7's flat membrane switches) across the control panel. The instrument communicates with the user via a 16 character, dot matrix, non-backlit liquid crystal display (LCD). Sixteen characters are usually enough to get the message across without being too cryptic. To the left of the display, two sliders control output volume and data entry; above these, in the instrument's upper left corner, are the pitch bend and mod wheels. The DX100 has pegs on either side for a strap, so I assume the placement of the wheels is to allow their use from either the front or by reaching around the back with your left fingers, as you might if you were using the DX100 as a strap-on keyboard. The ranges are adjustable for both wheels and there are three choices for pitch bend mode (bend all notes held, highest note, or lowest note). The top of the control panel has printed diagrams of the eight algorithms and a graph illustrating envelope generator parameters. All rear plugs are labelled on the top of the unit so you don't have to stand on your head to figure out which plug goes where.

On the rear panel, you'll find MIDI In,

***Charles Williamson** has been an audio recording hobbyist for 15 years, and has been recording electronic music in his home studio for the last ten. His most recent production,* Music by Dead People, *features "electronic music composed on an Ouija board by the spirits of people killed in car accidents." He can be reached at 1716 Stonehill Drive, Columbia, MO 65201.*

Out, and Thru jacks; two ¼-inch output jacks (one for headphones); an input connector for an optional Yamaha breath controller (breath controller functions are programmable); a display contrast control; a DIN connector for the cassette interface; optional external power supply jack; the power switch; and a jack for a Yamaha footswitch (the footswitch is not included). The instrument can be programmed for footswitch control of either sustain or portamento.

For those who haven't tried the breath controller, this is a little sensor that you hold in your mouth and blow into to modulate timbre or volume. It can be used with a variety of Yamaha instruments. If you have some experience with wind instruments this may be just the thing for you, but if not, watch out! You have to blow pretty hard and you can get red-faced and dizzy in no time.

VOICE/PRESET RECALL

I don't mind saying that I initially found the DX100 method of voice selection and storage the single most confusing part of the instrument.

While at first it appears to have a total of 216 locations for presets and user programmable voices, actually only 24 of those locations have RAM storage; the rest are "pointers" only. They can point to and retrieve any of the 192 presets supplied in ROM, or to whatever you have programmed into the 24 RAM locations. The idea here is that you will want to arrange the voices to match the order they will be used in performance, and the preset arrangement scheme works well for that. What the user must realize is that if a RAM voice is stored into one of these pointer locations, and later modified or erased in its *original* RAM location, it is also modified or erased in its pointer location. Common sense, to be sure, but the terminology used on the instrument control panel won't logically lead you to this conclusion.

These pointer locations are called *bank memory* on the instrument, and are arranged in four banks (A-D) of 24 programs to correspond with the 24 program selector buttons. If you are quick with your arithmetic, you will realize that this only covers 96 of the 192 locations. To access the other 96, you must go into *shift* mode by holding down two buttons simultaneously—neither of which is marked for this purpose. Once in shift mode you can access the remaining four banks of 24. A similar process is required to exit shift mode and return to normal mode. The 24 RAM voices can be called up from either mode.

The only way MIDI can access the preset voices is through the bank memory, and as mentioned above, only half of the bank memory is available at any one time. Since there is no MIDI command to go into or out of shift mode (except possibly system exclusive, which may be difficult or impossible to program on your sequencer), you can't go from one preset to another via MIDI unless they both reside in the bank memory in the same mode. If you want your preset sequence to include sounds from shift *and* normal mode you can load the presets you want from the "other" mode into a RAM location; these RAM presets can be accessed from either mode, but this uses up the precious 24 user programmable memory spaces.

> *"The sound is outstanding... and the simplification that results from fewer voice parameters may be just the thing for frustrated DX7 programmers"*

The DX100 can transfer voice data between the instrument and a cassette recorder over the provided custom cord. Voices are stored in groups of 24 and retrieved in groups of 24. Also, a single voice from a group of 24 stored on tape may be loaded into the instrument. All of these transfers are to and from the 24 RAM locations, referred to as *internal memory*.

IS IT A LITTLE DX7?

As you might expect, with a difference of $1,650 in their price tags, a few compromises have been made with the DX100. The most obvious is in the keyboard, a four octave, mini-key variety with no touch sensitivity. (This compares to the DX7's full size, five-octave, velocity-sensitive keyboard with aftertouch.) It's interesting to note that the DX100 *will* respond to velocity information over MIDI, so if you already have a velocity sensitive MIDI keyboard you're in business. Even if you don't, this feature can be used to good advantage with a sequencer that can edit velocity data. DX100 programming functions allow you to control timbre, note volume, or both with MIDI key velocity data.

The DX100 voice circuitry is different primarily by the use of only four operators; also, the envelope generators aren't as complex as those on the DX7. The sound that results is still unmistakably from the DX family, although maybe not as refined. Percussive attacks sound a little more synthetic, or dirty. Trailing tones don't seem as pure (though I'm not sure why). The sound is outstanding nonetheless, and the simplification that results from fewer voice parameters may be just the thing for frustrated DX7 programmers.

DX100 OR CZ-101?

Even though these two instruments bear a resemblance to each other, and are priced similarly, the decision of which to buy is not too difficult if you know what you want out of the purchase.

DX100 advantages are:

✓ The DX sound. The Casio can make some nice percussive, crisp sounds, but I don't think they sound as naturally complex as the Yamaha.

✓ Eight note polyphony. The CZ-101 can play eight notes with some voices but only four with most.

✓ Velocity sensitive voices. Even though you can't use this function with the keyboard on the instrument, it is at least accessible. The CZ-101 voice circuitry does not respond to MIDI velocity data.

✓ Mod wheel. The Casio has none, although it is possible to add one (see "CZ Mods" by Alan Gary Campbell in the August 1986 **EM**).

CZ-101 advantages are:

✓ Multi-timbral. When used in a MIDI sequencer environment, the Casio can play four different sounds at once. This may be important if this is to be your only or main MIDI instrument.

✓ Easier to program. The Casio programs much the same as traditional analog synthesizers, and each button has only one function! However, note that the DX100 is not as difficult to program as the DX7, and the use of a slider for data entry is faster than the Casio's up-down buttons.

Either way, this is a pleasant choice to have to make. The introduction of an FM MIDI synthesizer at this price is good news for anyone who wants to make electronic music on a budget.

Acknowledgement: Thanks to Hennessy & Sons Music in Columbia, MO for the use of a DX100 for this review. **EM**

DataBank

Compute!: P.O. Box 5406, Greensboro, NC 27403; tel. 919-275-9809.

algorithm: A computational procedure that specifies a finite set of steps which, if followed, give the solution to a problem.

A/B comparison: A method of comparing two sound signals by switching back and forth between them.

linear pot: A potentiometer whose resistance changes at a constant linear rate. In other words, an equal amount of control rotation produces the same increase or decrease in resistance.

logarithmic pot: Also called *audio taper potentiometer*. A potentiometer whose resistance changes at a logarithmic rate. In other words, for an equal amount of control rotation progressively more resistance will be covered.

JDR Microdevices: 1224 South Bascom Avenue, San Jose, CA 95128; tel. 1-800-538-5000 or 408-995-5430 (in California).

C.O.M.B. Direct Marketing Corp.: 14605 28th Avenue North, Minneapolis, MN 55441-3397; tel. 800-328-0609.

DAK Industries, Inc.: 8200 Remmet Avenue, Canoga Park, CA 91304; tel. 800-DAK-0800.

Digi-Key: 701 Brooks Avenue South, P.O. Box 677, Thief River Falls, MN 56701.

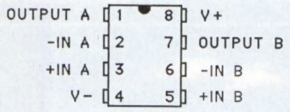
IMA (International MIDI Association): 11857 Hartsook Street, North Hollywood, CA 91607; tel. 818-505-8964.

Passport: 1625 Miramontes Street, Half Moon Bay, CA 94019; tel. 415-726-0280.

SCI (Sequential Circuits Incorp.): 3051 North First St., San Jose, CA 95134.

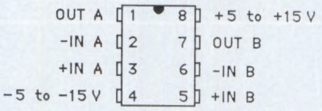
353

Wide Bandwith Dual JFET Input Operational Amp


OUTPUT A 1 8 V+
-IN A 2 7 OUTPUT B
+IN A 3 6 -IN B
V- 4 5 +IN B

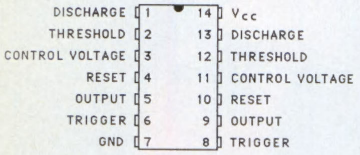
1458

Dual Operational Amplifier


OUT A 1 8 +5 to +15 V
-IN A 2 7 OUT B
+IN A 3 6 -IN B
-5 to -15 V 4 5 +IN B

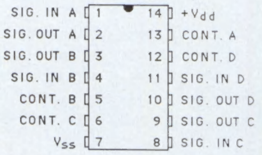
556

Dual Timer


DISCHARGE 1 14 Vcc
THRESHOLD 2 13 DISCHARGE
CONTROL VOLTAGE 3 12 THRESHOLD
RESET 4 11 CONTROL VOLTAGE
OUTPUT 5 10 RESET
TRIGGER 6 9 OUTPUT
GND 7 8 TRIGGER

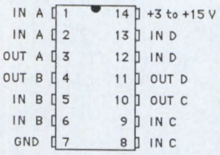
4066

CMOS Quad Bilateral Switch


SIG. IN A 1 14 +Vdd
SIG. OUT A 2 13 CONT. A
SIG. OUT B 3 12 CONT. D
SIG. IN B 4 11 SIG. IN D
CONT. B 5 10 SIG. OUT D
CONT. C 6 9 SIG. OUT C
Vss 7 8 SIG. IN C

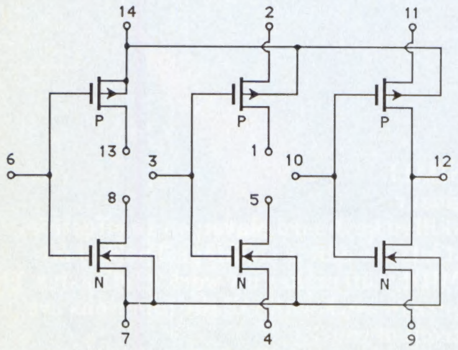
4001

CMOS Quad 2-Input NOR Gate


IN A 1 14 +3 to +15 V
IN A 2 13 IN D
OUT A 3 12 IN D
OUT B 4 11 OUT D
IN B 5 10 OUT C
IN B 6 9 IN C
GND 7 8 IN C

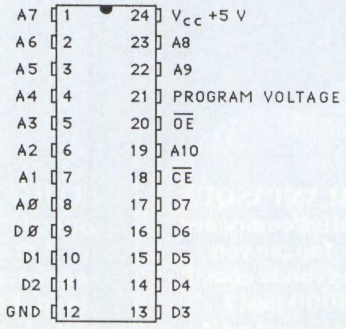
4007

Dual CMOS Pair Plus Inverter


14
2
11
P
P
P
13
1
3
10
6
12
8
5
N
N
N
7
4
9

2716

EPROM


A7 1 24 Vcc +5 V
A6 2 23 A8
A5 3 22 A9
A4 4 21 PROGRAM VOLTAGE
A3 5 20 OE
A2 6 19 A10
A1 7 18 CE
A0 8 17 D7
D0 9 16 D6
D1 10 15 D5
D2 11 14 D4
GND 12 13 D3

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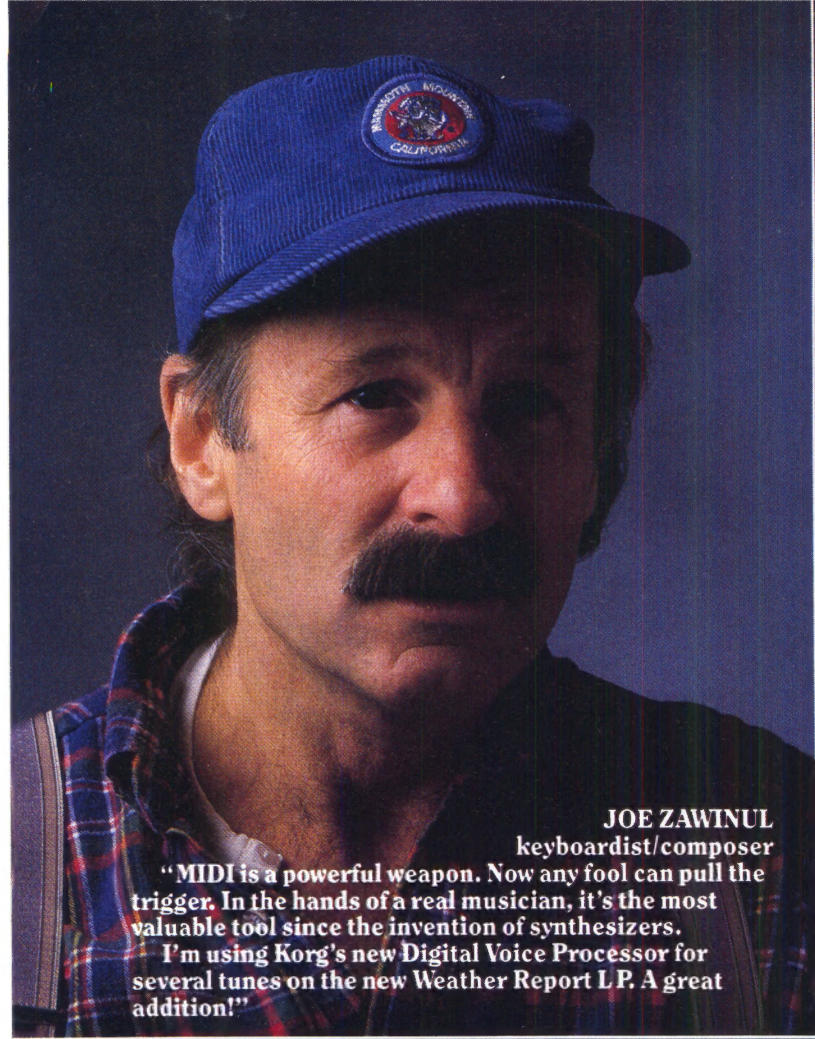
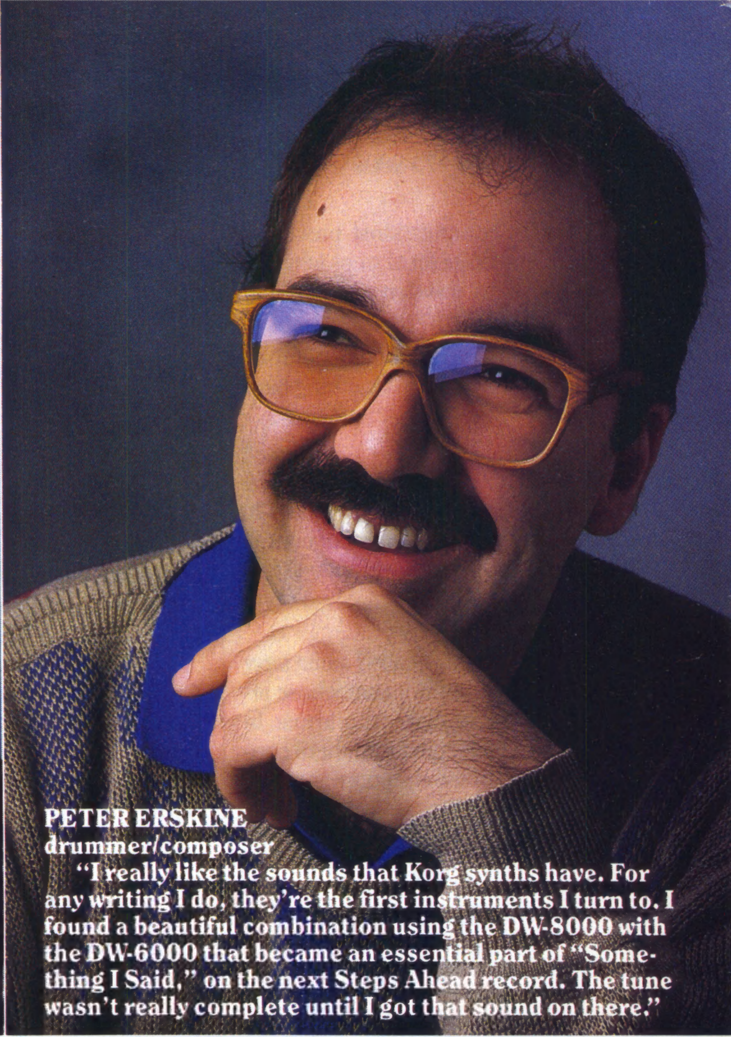


JOE ZAWINUL
keyboardist/composer

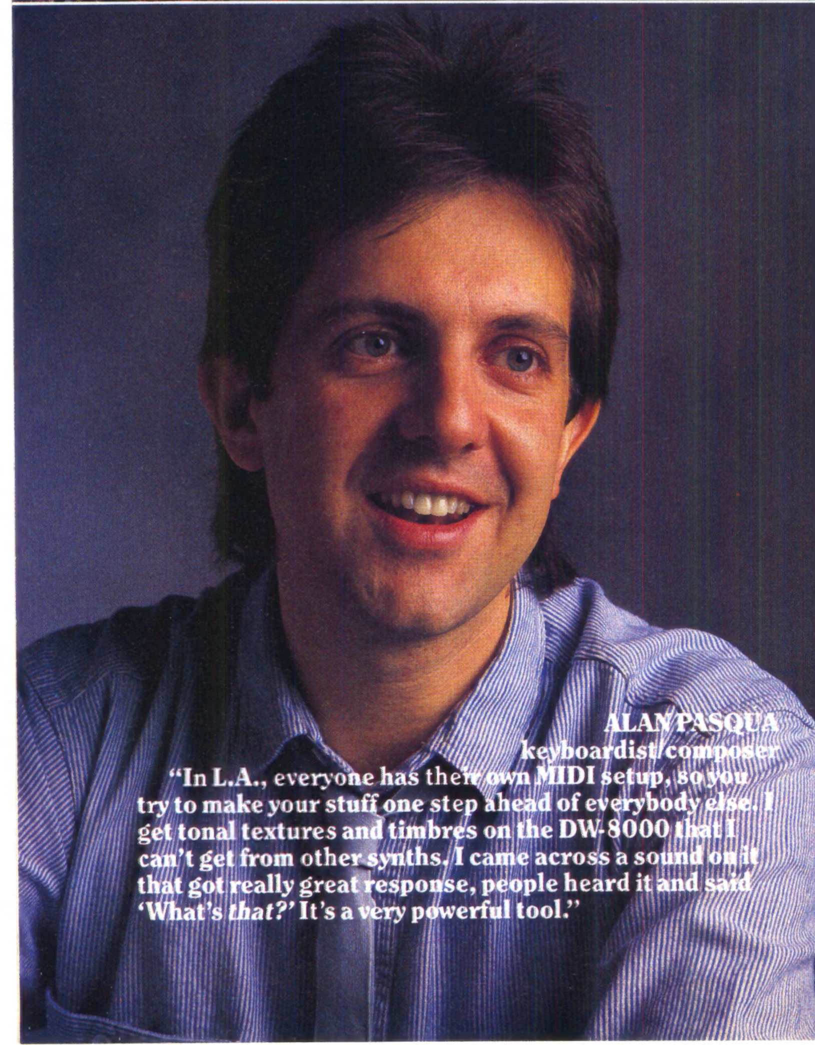
"MIDI is a powerful weapon. Now any fool can pull the trigger. In the hands of a real musician, it's the most valuable tool since the invention of synthesizers.

I'm using Korg's new Digital Voice Processor for several tunes on the new Weather Report LP. A great addition!"



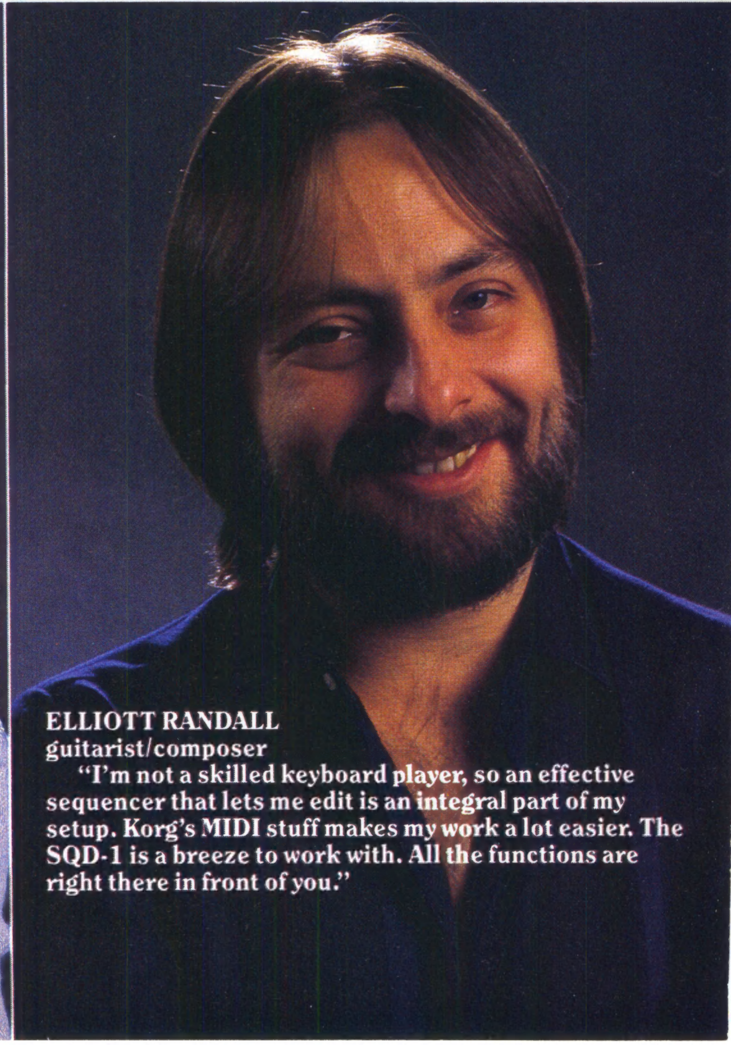
PETER ERSKINE
drummer/composer

"I really like the sounds that Korg synths have. For any writing I do, they're the first instruments I turn to. I found a beautiful combination using the DW-8000 with the DW-6000 that became an essential part of "Something I Said," on the next Steps Ahead record. The tune wasn't really complete until I got that sound on there."



ALAN PASQUA
keyboardist/composer

"In L.A., everyone has their own MIDI setup, so you try to make your stuff one step ahead of everybody else. I get tonal textures and timbres on the DW-8000 that I can't get from other synths. I came across a sound on it that got really great response, people heard it and said 'What's *that?*' It's a very powerful tool."



ELLIOTT RANDALL
guitarist/composer

"I'm not a skilled keyboard player, so an effective sequencer that lets me edit is an integral part of my setup. Korg's MIDI stuff makes my work a lot easier. The SQD-1 is a breeze to work with. All the functions are right there in front of you."

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DW-8000 MASTER KEYBOARD: The widest range of velocity- and pressure-sensitive sounds. Send or receive all MIDI data including after touch, pitch bend, modulation, program select, damper and portamento. Variable MIDI Send and Receive channels.

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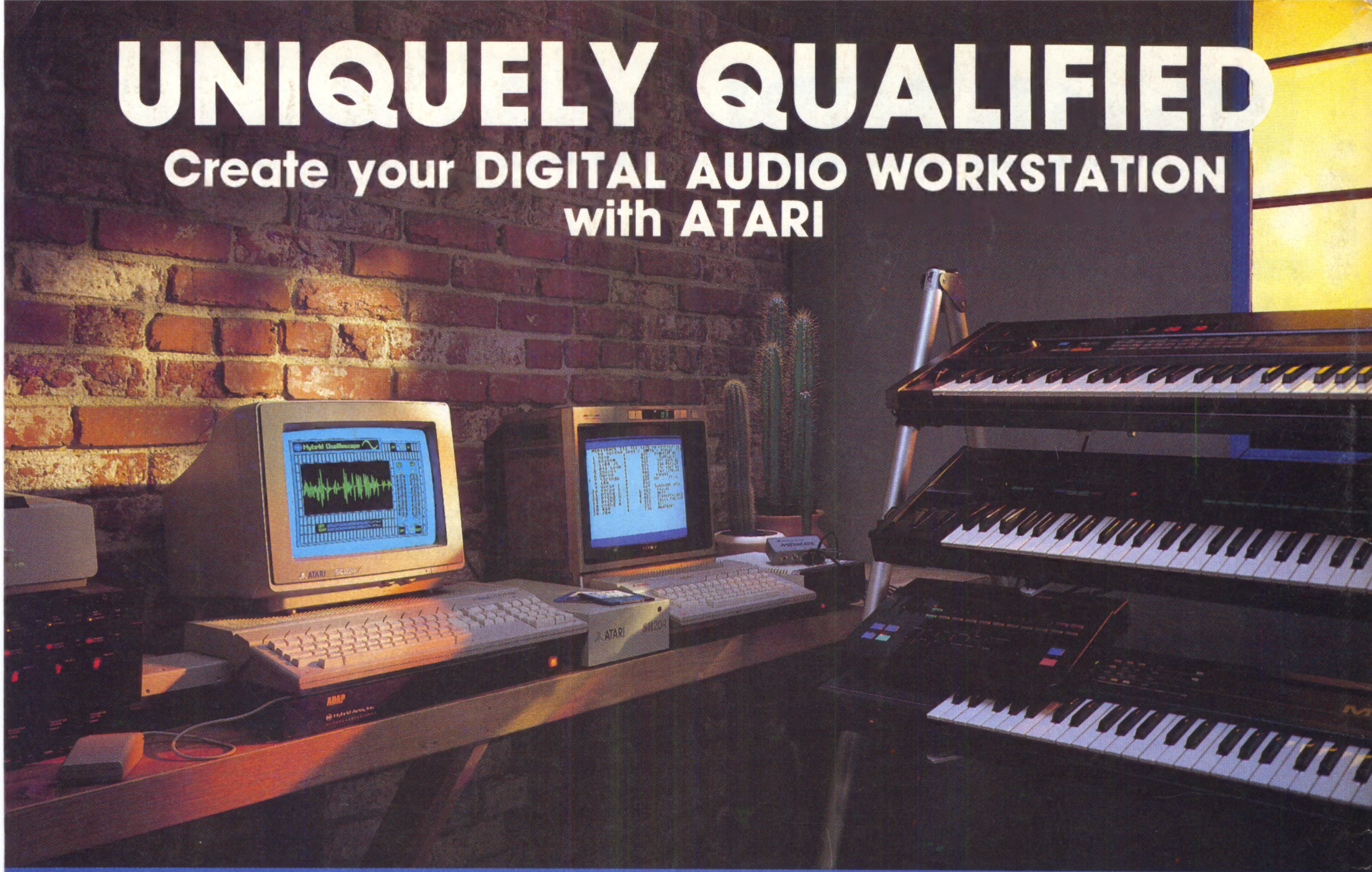

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Atari has championed digital music technology ever since MIDI debuted. With the introduction of the amazing 520ST and 1040ST computers, stage, studio and non-professional musicians have access to the world's only 16/32 bit computer with MIDI built-in. The ST with its 68000 CPU running at 8 mhz is faster than any of it competitors. The ST with either 512K or 1 megabyte is more powerful, able to store thousands more MIDI events. And price-wise -- to put it bluntly, the 520ST and 1040ST beat the stuffing out of all competitors.

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